THE OIL WEEKLY

ENGINEERING « NEWS » STATISTICS

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THE OIL WEEKLY
REFINER AND NATURAL GASOLINE MANUFACTURER

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The Oil Man's Calendar

JUNE 3	Illinois-Indiana Petroleum Association, Robinson, Illinois.
15–16	Pennsylvania Grade Crude Oil Association, Hershey, Pa.
July 10–17	American Institute of Mining and Metallurgical Engineers Regional Meeting, San Francisco, Calif.
AUG. 1– 6	The Eastern United States Michigan Oil & Gas Exposition. Mt. Pleasant, Michigan.
SEPT. 4– 8	American Society of Mechanical Engineers, New York.
5	Oil Workers International Union, Hammond, Ind.
11–15	American Chemical Society, Boston, Mass.
9–13	American Chemical Society, Detroit, Mich.
13–15	National Petroleum Association, Atlantic City, N. J.
OCT. 9–10	American Gas Association Annual Convention, New York.
16–20	National Safety Congress, Atlantic City, N. J.
18–20	Independent Petroleum Association of America, Fort Worth, Texas.
NOV. 13–17	American Petroleum Institute, 20th Annual Meeting, Stevens Hotel, Chicago.
15–17	American Institute of Chemical Engineers, Providence, R. I.
DEC. 4–7	American Society of Mechanical Engineers, Philadelphia.

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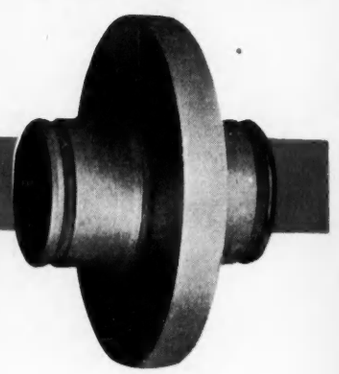

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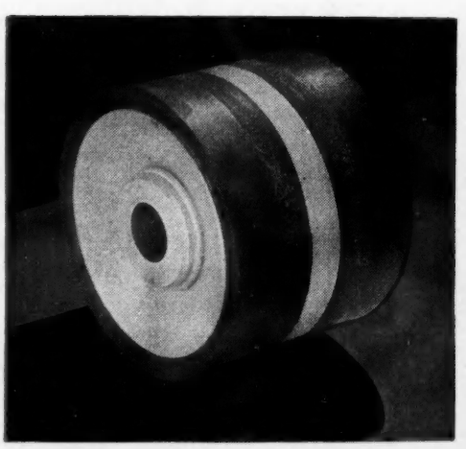

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This Week's Panorama

THE oil industry's situation currently is fairly satisfactory, as remarkably good demand for petroleum products has tended to minimize the seriousness of recent overproduction and over-refining of crude oil.

Furthermore, curtailment of crude output has been made stricter under May allowables, and the more moderate crude production probably will tend to promote more economic refinery runs.

The industry's markets currently reflect the relatively favorable situation. The gasoline market remains firm, although retail prices have made only slight gains in response to the improvement in wholesale prices in the past two months. The crude markets have been bolstered, meanwhile, by the better gasoline market.

Oil Burner Sales Relatively Good

Sales of oil burners are running under the high levels of 1937 but well above the levels of 1938. Shipments in the first three months of 1939 totaled 27,083 burners, compared with 19,743 in the similar period of 1938 and 33,530 in the first three months of 1937, according to the Department of Commerce.

The shipments in March, 1939, totaled 10,671 burners, compared with 7,867 in March, 1938, and 14,428 in March 1937.

These figures refer to oil burners and oil burner units consuming fuel oil of commercial standard No. 1 grade, or heavier, used for application to central heating plants for homes, apartments, office buildings, churches, theaters and similar buildings; to industrial process equipments such as heat treating furnaces, industrial ovens; and for generation of steam for power. The figures do not, however, include burners used in ranges, stoves, water heaters, and space heaters, which are included in a report on "distillate oil burners."

Shipments of distillate oil burners in the first three months of 1939 totaled 37,639 units, the Department of Commerce reported, compared with 19,637 in the similar period of 1938 and 40,954 in the corresponding period of 1937. Shipments of the distillate oil burners in March, 1939, included 17,648 burners, compared with 7,652 in March, 1938, and 22,942 in March, 1937.

Farmers Like Gasoline for Tractors

Farmers of the United States have revealed a strong preference for gasoline as a fuel for tractors. In a survey conducted recently by 43 prominent farm publications in cooperation with Ethyl Gasoline Corporation, it was found that gasoline accounted for 63 percent of the fuel burned in tractors on the farms represented in the survey, distillate for 24.7 percent, and kerosene 9.7 percent.

Of 6729 farmers who replied, 4228 owned a total

Business Relatively Active Despite Slowing Down

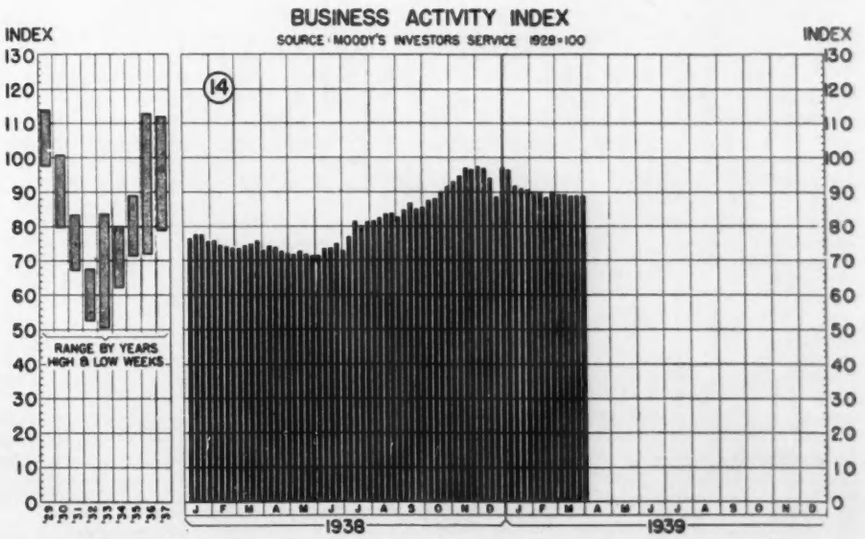
THE oil industry's outlook has remained uncertain, because of the uncertainty in which the general business situation is clothed.

For consumption of petroleum products ultimately is affected, for better or worse, by general business conditions; although the oil industry may not appreciably feel the effects of a change in the general situation for several months.

Some economists and business executives are expecting an acceleration of business activity during the remainder of this year, because of heavy government spending, if for no sounder reason; although considerable anxiety prevails, in view of the relatively poor showing made by business activity so far this year, following the brisk expansion in the latter half of last year.

Business activity receded somewhat in the first three months of this year, as shown in the accompanying chart, and it declined a little more in April. However, it remains well above the corresponding level of last year.

So far this year, business activity has been around the average level of 1936, which was a comparatively good year.



of 5441 tractors, or an average of about 5 tractors for every 4 tractor-owning farmers. (There are now about 1,600,000 tractors on American farms.)

Of the 5441 tractors represented in the survey, about 1347, or 25 percent, had high compression engines that required gasoline, although such engines have been sold by the tractor industry only during the past 4 years. The other 4094 tractors, which constituted 75 percent of the total, were low compression machines.

The farmers covered by the survey reported aggregate yearly use of 5,527,903 gallons of tractor fuels (an average of 1016 gallons per tractor per year), 3,240,743 gallons of fuel for trucks, and 3,945,509 gallons for automobiles.

Oil and Gas for Electric Plants

In its report for 1938 on electric power statistics, the Federal Power Commission showed that hydro-electric plants became relatively more important as sources of electric energy during that year, while steam and internal combustion plants became relatively less important.

The hydro-electric plants furnished 38.4 percent of total output in 1938, compared with only 36.5 percent in 1937.

Total production of electric energy in the United States by all types of prime movers in 1938 was 116,681,423,000 kilowatt-hours, or 4 percent less than in 1937, although output was on a steady upward trend from May to the end of the year and reached a new all time peak in December.

Production was slightly larger in 1938 than in 1937 at both hydro-electric and internal combustion type plants, but output was off materially in the steam plants.

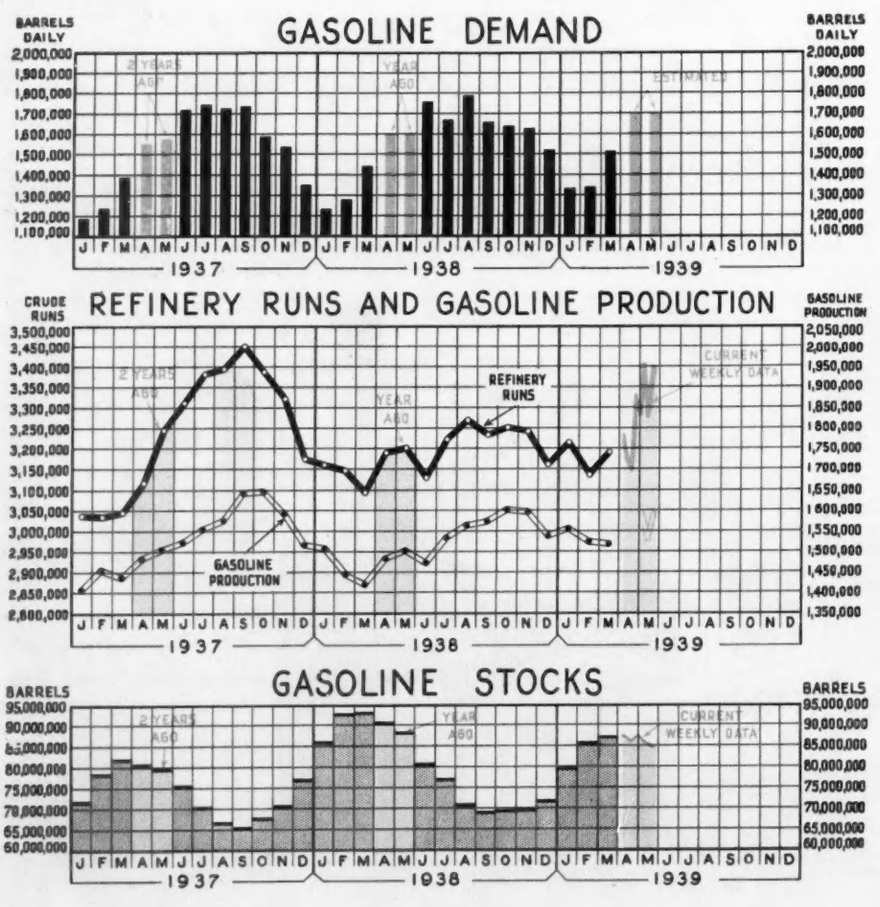
The report embodied figures on annual consumption of coal, fuel oil, and gas for production of electric energy. The figures showed that the consumption of coal was 10.2 percent lower in 1938 than in 1937, while fuel oil consumption was down 7.5 percent and gas use was off 3/10 of 1 percent. Thus demand held up better for fuel oil and gas than for coal, and gas fared better than fuel oil at the electric plants.

Fuel oil consumption at the electric plants totaled 13,077,000 barrels in 1938, compared with 14,143,000 barrels in 1937. Gas consumption was 170,688,000,000 cubic feet in 1938, compared with 171,268,000,000 cubic feet in 1937.

Large Demand Aids Gasoline Situation

REMARKABLY good demand has kept the gasoline situation fairly satisfactory despite exceptionally large refinery runs and gasoline production.

Although crude runs to stills were stepped up sharply in the week ended May 13, with the result that gasoline production increased to a new peak for this year, the markets absorbed not only all the current output but also a substantial amount of stored gasoline. The stocks of finished and unfinished gasoline were drawn upon to the extent of 1,408,000 barrels within the week, having been reduced to 84,808,000 barrels.


GASOLINE DEMAND
BARRELS DAILY
2 YEARS AGO
YEAR AGO
ESTIMATED
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1937
1938
1939
REFINERY RUNS AND GASOLINE PRODUCTION
CRUDE RUNS
GASOLINE PRODUCTION
REFINERY RUNS
CURRENT WEEKLY DATA
GASOLINE PRODUCTION
GASOLINE STOCKS
BARRELS

The gasoline inventory then was 4.3 percent smaller than at the corresponding time last year, although gasoline demand has been running around 5 percent larger this year than last year.

However, the stocks of gasoline were seriously excessive a year ago, and last year's inventory cannot be used as a pattern for this year.

In rising during the week ended May 13 to 3,400,000 barrels daily from 3,275,000 barrels the week before, crude runs to stills almost duplicated the record for this year, of 3,405,000 barrels daily, established in the week ended April 29.

Gasoline production was increased to 11,172,000 barrels, or 1,596,000 barrels daily, in the week ended May 13, from 10,732,000 barrels or 1,533,000 daily, in the previous week. The output was thus 440,000 barrels greater for the week or 63,000 barrels a day higher.

Yet, as pointed out above, the markets absorbed all the current production of gasoline plus 1,408,000 barrels from storage.

Brisk Oil Demand Promotes Favorable Situation

By L. J. LOGAN, Associate Editor

DEVELOPMENTS in the oil industry lately have been predominantly favorable.

The latest weekly statistics brought evidence of sharp curtailment of crude oil production, as one of the two Saturday shutdowns of May in Texas was reflected. (The state eliminated Saturday closings in April but reinstated them for two weeks in May, and also continued the long-established Sunday closings.)

Gasoline Demand Good

Crude oil runs to stills have continued high, and gasoline production has been similarly large. But gasoline stocks gradually are being reduced, as demand is proving sufficiently large to absorb not only the current gasoline production but substantial quantities from storage. The gasoline stocks are considered several millions of barrels larger than necessary, but the excess does not appear serious, in view of the current good demand.

Stocks of both heating and industrial fuel oils are lower than at this time last year, whereas demand is larger.

Markets Are Firm

The wholesale gasoline market has continued to display strength, although the retail markets have not improved materially.

The markets for crude oil naturally have been favorably affected by the improvement of the gasoline market, although some local situations remain unsatisfactory, because of overproduction, as in Illinois and California.

The national situation regarding

Favorable Current Trends of Oil Demand Indicated by Bureau of Mines Forecasts

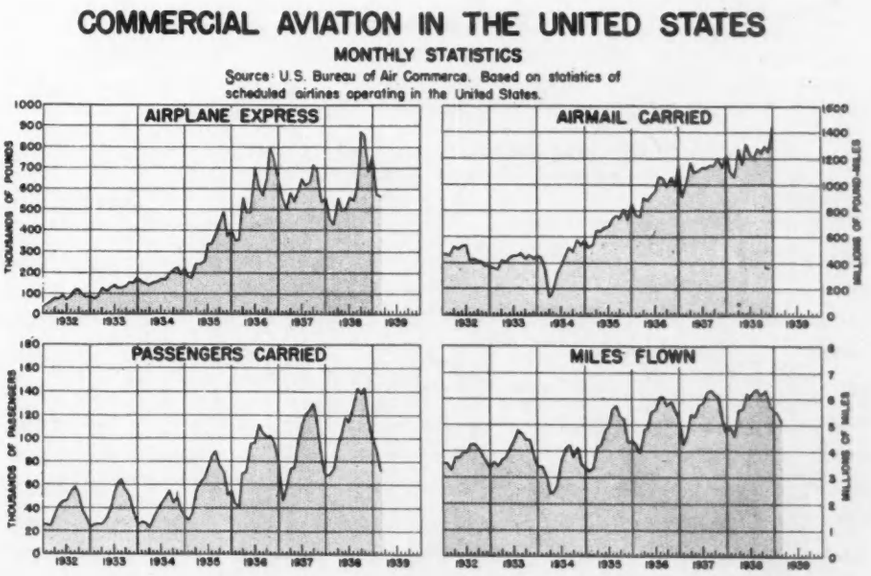
(Barrels)

MONTH	Total Demand for Domestic Crude	MOTOR FUEL DEMAND		
		Domestic	Export	Total
April, 1939:				
April, 1939, forecast	103,020,000	46,300,000	4,300,000	50,600,000
April, 1938, actual	103,732,000	43,254,000	4,474,000	47,728,000
Change from year ago	—0.7%	+7.1%	—3.7%	+6.0%
May:				
May, 1939, forecast	106,180,000	48,000,000	4,300,000	52,300,000
May, 1938, actual	106,290,000	44,911,000	4,576,000	49,487,000
Change from year ago	—0.1%	+6.9%	—6.0%	+5.7%

Aviation One Cause of Increasing Demand For Petroleum

AVIATION represents one of the important causes for the long-term upward trend of oil consumption, as airplanes are coming into ever greater use, along with automobiles, trucks, tractors, oil burners, and other consumers of petroleum products.

The accompanying chart shows the consistently increasing importance of aviation in the United States. In February, 1939, 564,928 pounds were carried by airplane express, compared with 421,326 pounds in February, 1938. Passengers carried numbered 72,496 in February, 1939, compared with 73,563 in February, 1938. Airmail carried totaled 1,431,000,000 pound-miles in December, 1938, compared with 1,234,000,000 pound-miles in December, 1937. Miles flown on airlines totaled 5,031,000 in February, 1939, compared with 4,561,000 in February, 1938.


COMMERCIAL AVIATION IN THE UNITED STATES
MONTHLY STATISTICS
Source: U.S. Bureau of Air Commerce. Based on statistics of scheduled airlines operating in the United States.
AIRPLANE EXPRESS
THOUSANDS OF POUNDS
AIRMAIL CARRIED
MILLIONS OF POUND-MILES
PASSENGERS CARRIED
THOUSANDS OF PASSENGERS
MILES FLOWN
MILLIONS OF MILES
1932 1933 1934 1935 1936 1937 1938 1939

Demand for Petroleum Materially Better This Year Than Last Year

Figures indicate barrels and are from Bureau of Mines.

ITEM	JANUARY COMPARISON			FEBRUARY COMPARISON			MARCH COMPARISON			YEARLY COMPARISON		
	Jan., 1938	Jan., 1939	Percent Change	Feb., 1938	Feb., 1939	Percent Change	March, 1938	March, 1939	Percent Change	First 3 Mos., 1938	First 3 Mos., 1939	Percent Change
Total Demand	103,414,000	111,889,000	+ 7.6	94,945,000	100,813,000	+ 6.4	110,237,000	115,170,000	+ 4.4	308,596,000	326,674,000	+ 5.2
Daily average	3,336,000	3,609,000	+ 7.6	3,391,000	3,600,000	+ 6.4	3,566,000	3,715,000	+ 4.4	3,429,000	3,630,000	+ 5.2
Exports:												
Crude petroleum	5,953,000	4,477,000	—24.7	5,328,000	4,810,000	— 9.7	6,121,000	4,966,000	— 18.8	17,402,000	14,253,000	—18.4
Refined products	7,988,000	8,491,000	+ 6.3	8,605,000	7,335,000	—14.7	9,204,000	10,849,000	+ 17.9	25,797,000	26,678,000	+ 3.6
Domestic Demand:												
Motor fuel	35,176,000	37,847,000	+ 7.6	31,861,000	34,595,000	+ 8.6	41,259,000	42,520,000	+ 3.2	108,296,000	114,882,000	+ 6.1
Kerosene	5,360,000	5,980,000	+11.6	5,017,000	5,901,000	+17.7	5,150,000	5,201,000	+ 0.1	15,527,000	17,082,000	+ 9.7
Gas oil and distillate fuels	12,642,000	15,742,000	+24.5	11,651,000	13,690,000	+17.1	10,487,000	12,304,000	+ 26.8	34,780,000	41,743,000	+20.2
Residual fuel oils	25,844,000	29,484,000	+14.0	23,627,000	25,139,000	+ 6.4	25,696,000	28,071,000	+ 1.0	75,167,000	81,569,000	+ 8.5
Lubricants	1,471,000	1,609,000	+ 9.4	1,311,000	1,653,000	+25.9	2,195,000	1,987,000	— 9.5	4,977,000	5,249,000	+ 5.0
Wax	115,000	74,000	—35.6	82,000	97,000	+18.3	90,000	73,000	— 18.9	287,000	244,000	—14.9
Coke	535,000	532,000	— 0.5	416,000	605,000	+45.5	308,000	646,000	—109.5	1,259,000	1,781,000	+41.2
Asphalt	1,077,000	1,062,000	— 1.4	883,000	833,000	— 5.7	1,444,000	1,269,000	— 12.1	3,404,000	3,163,000	— 7.3
Road oil	151,000	173,000	+14.6	168,000	180,000	+ 7.1	131,000	228,000	+ 74.0	450,000	581,000	+28.9
Still gas	4,937,000	5,081,000	+ 2.9	4,428,000	4,629,000	+ 5.5	4,901,000	5,376,000	+ 9.7	14,266,000	16,086,000	+ 5.8
Miscellaneous	137,000	173,000	+26.3	132,000	153,000	+15.9	137,000	187,000	+ 36.5	406,000	513,000	+26.4
Losses	2,028,000	1,164,000	—42.6	1,436,000	1,193,000	—16.8	3,114,000	1,493,000	— 52.2	6,578,000	3,850,000	—41.5
Total domestic demand	89,473,000	98,921,000	+10.5	81,012,000	88,668,000	+ 9.4	94,912,000	99,355,000	+ 4.7	265,397,000	285,743,000	+ 7.7
Daily average	2,886,000	3,191,000	+10.5	2,893,000	3,167,000	+ 9.4	3,062,000	3,205,000	+ 4.7	2,919,000	3,175,000	+ 7.7

crude production control has been improved.

So far this year, demand for petroleum and petroleum products has been somewhat exceeding expectations.

Figures on actual demand in the first three months of 1939, as reported by the Bureau of Mines, are presented in an accompanying table. They show that total demand for all United States oils ran 5.2 percent higher in the first quarter of this year than in that period last year.

Total exports were down about 5 percent, as an 18.4 percent decline in crude oil shipments outweighed a 3.6 percent increase in exports of refined products.

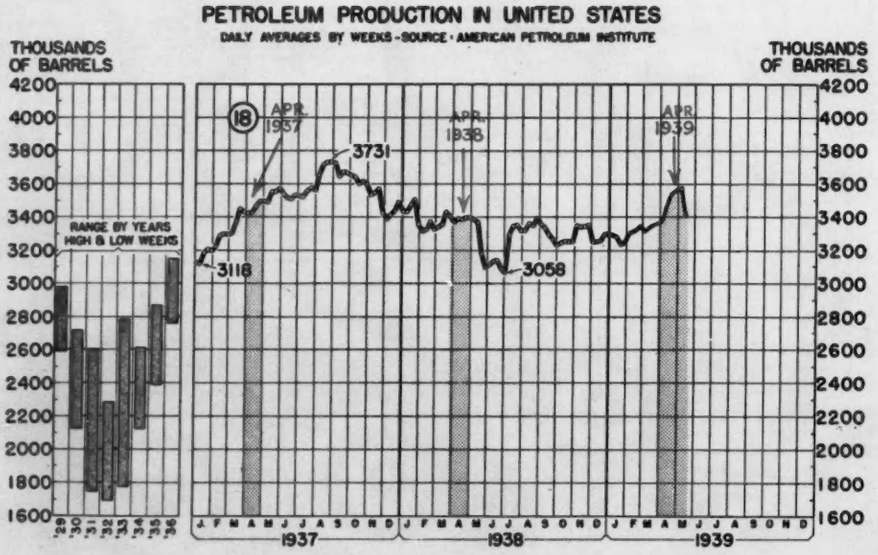
Total domestic demand was 7.7 percent larger in the first three months of 1939 than in the similar period of 1938, as nearly all products were used more extensively. Gains over last year included those of 6.1 percent for gasoline, 9.7 percent for kerosene, 20.2 percent for gas oil and distillate fuels (heating oils), 8.5 percent for residual fuel oils (industrial fuels), 5 percent for lubricants, 41.2 percent for coke, 28.9 percent for road oil, 5.8 percent for still gas, and 26.4 percent for miscellaneous products. The only decreases were those of 14.9 percent for wax and 7.3 percent for asphalt.

In its forecasts for April and May, the Bureau of Mines estimated that total demand for gasoline would be around 6 percent larger than in those months last year, having anticipated gains of about 7 percent in domestic consumption but slight decreases in exports.

April Crude Oil Production This Year Largest on Record

ALTHOUGH proration has appeared particularly strict in 1938 and 1939, the primary reason has been the continued drilling of new wells, which have claimed a share of the available market for crude oil.

While production per well has been curtailed, total production has approximated record proportions in recent months, and the output was greater in April, 1939, than in any other April on record.



United States production totaled 105,172,200 barrels in April, 1939, compared with 102,032,500 barrels in April, 1938, and 103,955,500 barrels in April, 1937.

Production for the first four months of the year amounted to 403,811,850 barrels in 1939, compared with 407,007,950 barrels in 1938 and 399,348,900 barrels in 1937.

The output of crude since March has been somewhat above market demand, as evidenced by substantial additions to crude storage, but the high production has been largely justified by petroleum consumption, which has held up remarkably well, despite the disturbed business conditions since early 1937.

Although new wells and new fields have increased the difficulty of holding crude production under satisfactory control, the problem has been to some extent simplified by the remarkably stable demand for petroleum products.

A Preliminary Evaluation of Factors Controlling Rate of Penetration in Rotary Drilling

By J. E. BRANTLY,
Drilling and Exploration Company, Los Angeles, California
and EDGAR H. CLAYTON,
Drilling and Exploration Company, Mattoon, Illinois.

EXTENSIVE tabulations and charts are presented for more than 500 wells in typical fields of Texas, Oklahoma, Louisiana, California, New Mexico, Wyoming, and Kansas, representing an attempt to ascertain the relative importance of four factors on rate of rotary-tool penetration during the past eight years. The total increase in rate of penetration is given as 123.7 percent, relative importance of three factors being: personnel and equipment, 55.5 percent; rotating speed, 39.6 percent; volume of drilling fluid, 28.6 percent; weight on bit is included in the above figures.

This paper was presented at the Ninth Mid-Year Meeting, American Petroleum Institute, at the Roosevelt Hotel, New Orleans, La., May 17, 1939. The statements and opinions expressed herein are those of the author, and should not be construed as an official action or opinion of the Institute nor of this publication.

AN exhaustive study of questionnaires, tour reports, bit records, and formation records has been made on representative fields of Texas, Oklahoma, Louisiana, California, New Mexico, Wyoming, and Kansas. The object of this study was to ascertain the importance of the several factors controlling and responsible for the increased rate of penetration through the earth's formations by rotary-drilling tools during the past 8 years; and to determine, if possible, the direct effect of each cause or factor and its definite relationship to other factors. The study of each field was completed only after detailed well data had been obtained from a sufficient number of wells to assure a representative existence of definite field conditions. In some fields the data were not considered complete until records of more than 50 wells had been analyzed; other fields required the study of only 12 or more. More or less complete drilling records of old wells, as well as recent ones, were studied—although it must be admitted that the former were quite unsatisfactory in most cases. A total of more than 500 rotary-well records of various types were employed.

It was necesasry that most fields be divided into component parts; i. e., geologic intervals of similar formations or drilling characteristics. Also, depths were correlated with equipment or physical changes. This physical correlation was made to account for changes in bit sizes, drill-pipe sizes, mud characteristics, fluid volumes, rotating speeds, and weight carried on the bit whenever such changes were consistently customary with all operators throughout the field.

Personnel and Equipment

The tabulated data of one field were sufficiently complete to show 14 wells drilled over a period of 3 years by the same drilling practice (see Table 1). The average fluid volume and pressure, drill-pipe size, mud characteristic, rotating speed, weight on the bit, size of bits and formations were reportedly the same for each of the 14 chosen wells. It was noted, however, that these wells, although drilled in the same manner, varied in their rate of penetration through the earth. A curve then was drawn by plotting penetration rate, in feet per hour against elapsed time by months, of the first spudded well to the last well drilled. This graph shows a definite trend of "penetration-rate increase" over the period of 36 months; and although some of the plotted points prevented the determination of an exact relationship (i. e., straight-line or slightly-varying curve), the average was assumed for all practical purposes and plotted as a straight-line function (see Figure 1). The seemingly safe conclusion to be drawn from this result, and based on the important fact that these wells all were drilled in accordance with the same drilling practice, is that the increased rate of penetration is due to increased efficiency of personnel and equipment.

The percentage increase in penetration rate, as determined from the graph of feet per hour vs. months, averages 18½ percent per year. This percentage of increase, therefore, should be accredited to personnel and equipment. Results of these plotted data are shown in Figure 1.

Rotating Speed

The next data tabulated for study were taken from areas in which a sufficient number of wells had been drilled by the same practice, except for rotating speeds (see Table 2). These wells were chosen because they were drilled over a period of 45 months, and bcause all factors relating to penetration rate were constant, except the previously-mentioned rotating speeds which represented an increase of 33 1/3 percent over the elapsed period of time.

An analysis of these data showed that the rate of penetration had increased materially, and by plotting penetration rate against rotating speeds in revolu-

TABLE 1

Penetration-Rate Increase Due to Improved Efficiency of Personnel and Equipment

DATE		Fluid Volume (Gallons Per Minute)	Character of Fluid		Table Speed (Revolutions Per Minute)	Weight on Bit (Tons)	Length of Drill Collar (Feet)	Type of Feed	Bit Size (Inches)	Number of Bits	Depth of Interval (Feet)	Hours Rotated	Feet Per Hour
Year	Mo.		Weight (Lb. Per Cu. Ft.)	Viscosity*									
1935	6	580	71	33	100–120	5–12	44	Brake	9 7/8	11	5,506	165	33.4
	7	580	71	33	100–120	5–12	44	Brake	9 7/8	11	5,638	164	34.4
	11	580	71	33	100–120	5–12	44	Brake	9 7/8	6	5,570	154	37.0
1936	3	580	71	33	100–120	5–12	44	Brake	9 7/8	13	5,535	159.5	34.7
	6	580	71	33	100–120	5–12	50	Brake	8 5/8	12	5,580	141	39.6
1937	1	580	71	33	100–120	5–12	55	Brake	8 5/8	10	5,660	134.5	42.0
	4	580	71	33	100–120	5–12	58	Brake	8 5/8	5	5,794	91	63.6
	3	580	71	33	100–120	5–12	58	Brake	8 5/8	6	5,895	127.5	46.2
	4	580	71	33	100–120	5–12	58	Brake	8 5/8	6	5,175	109	47.5
	6	580	71	33	100–120	5–12	58	Brake	8 5/8	8	5,841	121	48.2
	8	580	71	33	100–120	5–12	86	Brake	8 5/8	6	6,050	116.5	52.0
	11	580	71	33	100–120	5–12	90	Brake	8 5/8	7	5,960	118	50.5
1938	4	580	71	33	100–120	5–12	90	Brake	8 5/8	7	5,850	112.5	52.0
	6	580	71	33	100–120	5–12	98	Brake	8 5/8	5	5,775	104	55.5

* Viscosity by Marsh method; 500 ml. in and out.

TABLE 2

Penetration-Rate Increase Due to Increased Rotating Speed

DATE		Fluid Volume (Gallons Per Minute)	Character of Fluid		Table Speed (Revolutions Per Minute)	Weight on Bit (Tons)	Length of Drill Collar (Feet)	Type of Feed	Bit Size (Inches)	Number of Bits	Depth of Interval (Feet)	Hours Rotated	Feet Per Hour
Year	Mo.		Weight (Lb. Per Cu. Ft.)	Viscosity*									
1933	11	580	73	40	75	4	15	Brake	9 7/8	14	5,573	185	31.0
1934	3	580	73	40	75	4	15	Brake	9 7/8	8	5,565	170	33.3
	6	580	73	38	75	4	20	Brake	9 7/8	9	5,560	185	30.0
1935	9	580	73	38	85	4	15	Brake	9 7/8	6	5,566	125	44.5
	11	580	73	48	85	4	20	Brake	9 7/8	6	5,555	131	42.5
1936	2	580	73	30	85	4	15	Brake	9 7/8	6	5,566	129	43.0
	5	580	73	40	85	4	15	Brake	9 7/8	11	5,559	121	46.0
	9	580	73	38	90	4 1/2	15	Brake	9 7/8	3	5,557	113	49.5
	10	580	73	38	90	4 1/2	15	Brake	9 7/8	3	5,566	107	52.0
	12	550	73	42	90	3 3/4	40	Brake	8 5/8	3	5,542	109.5	50.5
1937	2	550	73	40	90	3	60	Brake	8 5/8	3	5,559	124	44.3
	3	550	73	35	100	5	60	Brake	8 5/8	3	5,539	100	55.4
	7	550	73	38	100	4	60	Brake	8 5/8	4	5,558	87.5	63.5
	8	550	73	35	100	5	60	Brake	8 5/8	3	5,561	89	62.5

* Viscosity by Marsh method; 500 ml. in and out.

tions per minute (r.p.m.) a surprisingly definite trend of increase was noted (see Figure 2). The relationship of this curve was established by selecting a line on the graph that would pass through a definite point for each table-speed change.

The percentage increase of penetration rate determined from this graph amount to 108 percent per 33 1/3 percent r.p.m. increase over the 45 months period. Of this amount 18½ percent per year (or a total of 69.4 percent) must be subtracted to account for improved materials and personnel. The resulting 39.6 percent is, therefore, that part of the penetration-rate increase occasioned by the table-speed increase of 33 1/3 percent (75 to 115 r.p.m.).

Fluid Volume

The third group of wells was studied to determine the effect of fluid volume upon the rate of penetration (see Table 3.) Wells from four fields were selected which showed constant table speeds and weight on the bit for each field, but which had been drilled with varying fluid volumes.

It was found advisable to select fields in which the wells representing varying fluid volumes had been drilled within less than a year. By making this selection a direct effect on the penetration rate could be determined without being unduly affected by the factor of time. Each field was plotted separately for the definite table speed applicable to that particular field; and, as the rate of penetration in each of these fields was different, it was necessary to select an arbitrary penetration-rate scale, and plot points in accordance with the percentage increase as determined for each separate field. The abritrary penetration rate was plotted against gallons per minute of fluid vol-

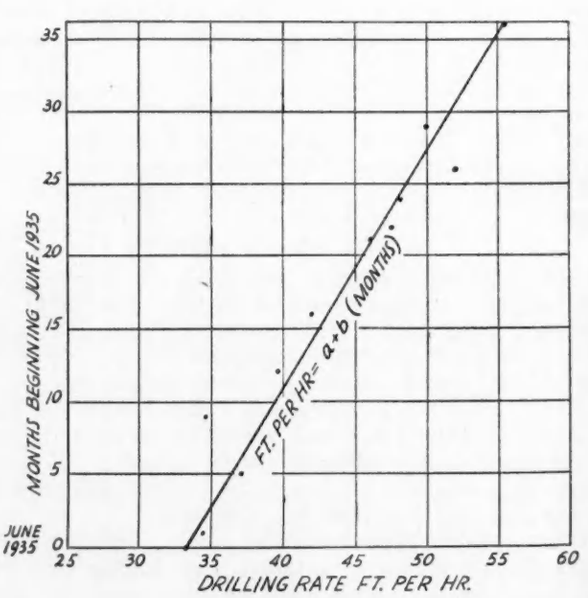


FIGURE 1

Graph Showing Penetration-Rate Increase Due to Improved Efficiency of Personnel and Equipment.

ume for a definite table speed of wells selected from each field. The table speeds of these fields were 80, 90, 120, and 160 r.p.m. The resulting graphs accounted for a direct relationship between rate of penetration and fluid-volume increase (see Figure 3).

At 80 r.p.m. the rate of penetration increase, between the limits of 550 and 750 gallons per minute, amounted to 23 percent.

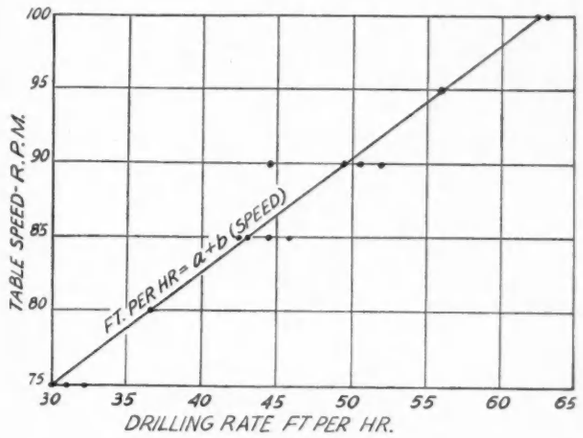


FIGURE 2
Graph Showing Penetration-Rate Increase Due to Increased Rotating Speeds.

At 90 r.p.m. the rate of increase was 25.6 percent.

At 120 r.p.m. the rate of increase was 31.6 percent.

At 160 r.p.m. the rate of increase was 34 percent.

In order to establish one figure to represent the rate of penetration increase allocated to fluid volume, an average of 28.6 percent per 200 gallons per minute of increase was determined.

Weight on Bit

The fourth set of data was selected to represent wells drilled by constant methods except for varying weight carried on the bit.

Of all available data used in preparing the graphs accompanying this paper, weight was by far the most difficult to evaluate. The principal reason for this is that the weights carried on bits have changed very little during the period covered by well records from which the study was made. Some wells were drilled with only the factor of weight being changed; but, because of the detailed information required on many wells before assuming a representative existence of

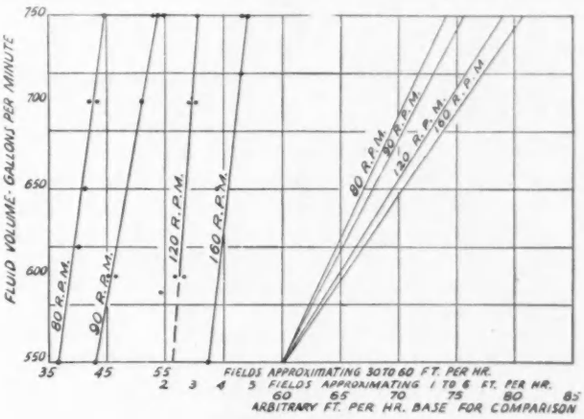

FLUID VOLUME-GALLONS PER MINUTE
80 R.P.M.
90 R.P.M.
120 R.P.M.
160 R.P.M.
FIELDS APPROXIMATING 30 TO 60 FT. PER HR.
FIELDS APPROXIMATING 1 TO 6 FT. PER HR.
ARBITRARY FT. PER HR. BASE FOR COMPARISON

FIGURE 3
Graph Showing Penetration-Rate Increase Due to Increased Fluid Volume.

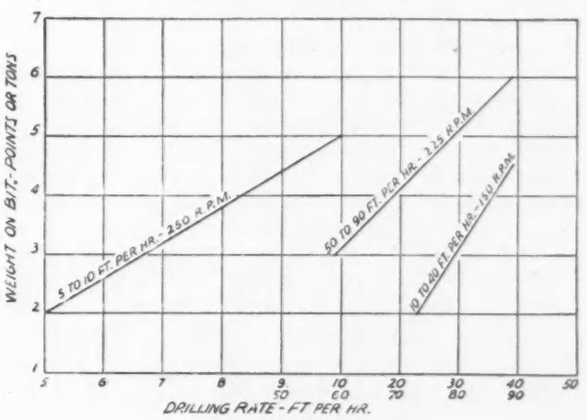


FIGURE 4
Graph Showing Penetration-Rate Increase Due to Increased Weight on Bit.

TABLE 3
Penetration-Rate Increase Due to Increased Fluid Volume

DATE (Year)	Fluid Volume (Gallons Per Minute)	Character of Fluid: Weight (Lb. Per Cu. Ft.)	Character of Fluid: Viscosity*	Table Speed (Revolutions Per Minute)	Weight on Bit (Tons)	Length of Drill Collar (Feet)	Type of Feed	Bit Size (Inches)	Number of Bits	Depth of Interval (Feet)	Hours Rotated	Feet Per Hour
1936	550	73	32	80	3–8	20–40	Brake	8¾–9⅝	..	3,215	88½	36.5
	550	73	34	80	3–8	20–40	Brake	8¾–9⅝	..	3,301	92	35.8
	650	73	33	80	3–8	20–40	Brake	8¾–9⅝	..	3,273	80	41.0
	700	71	30	80	3–8	20–40	Brake	8¾–9⅝	..	3,332	77	43.1
	700	71	30	80	3–8	20–40	Brake	8¾–9⅝	..	3,330	79	42.2
	750	75	36	80	3–8	20–60	Brake	8¾–9⅝	..	3,298	66	44.9
	550	75	35	90	4–12	68	Brake	9⅝	..	4,863	113	43.0
	600	73	33	90	4–12	68	Brake	9⅝	..	4,799	107	44.8
	600	74	32	90	4–12	68	Brake	9⅝	..	4,820	104½	46.2
	700	73	31	90	4–12	68	Brake	9⅝	..	4,838	96½	50.08
	750	73	33	90	4–12	68	Brake	9⅝	..	4,842	89½	54.0
	750	73	33	90	4–12	68	Brake	9⅝	..	4,840	90½	53.5
	750	73	33	90	4–12	68	Brake	9⅝	..	4,844	87½	55.1
	600	73	35	120	3–10	90	Hydraulic	12¼	..	1,175	480	2.47
	600	73	31	120	3–10	90	Hydraulic	12¼	..	1,190	457½	2.6
	600	74	32	120	3–10	90	Brake	12¼	..	1,316	560	2.35
	700	74	30	120	3–10	90	Brake	12¼	..	1,268	435½	2.91
	700	75	36	120	3–10	90	Hydraulic	12¼	..	1,308	428½	3.05
	750	75	35	120	3–10	90	Brake	12¼	..	1,232	379	3.25
	550	74	33	160	3–10	96	Brake	12¼	..	1,220	349	3.5
	650	74	32	160	3–10	96	Hydraulic	12¼	..	1,256	302	4.16
	650	74	34	160	3–10	96	Brake	12¼	..	1,308	331	3.95
	750	74	33	160	3–10	96	Hydraulic	12¼	..	1,168	249	4.69
	750	74	34	160	3–10	96	Brake	12¼	..	1,209	261½	4.62

* Viscosity by Marsh method; 500 ml. in and out.

conditions, it was necessary to make corrections for time, fluid volumes, and rotating speeds.

The results of this analysis (see Figure 4) show that, in formations approximating penetration rates of 5 feet to 10 feet per hour at 250 r.p.m., an increase of 100 percent in weight will result in a penetration-rate increase of 67 percent. It is noted, however, that this weight increase must be accomplished without a noticeable change in rotating speeds.

In drilling through formations with approximate penetration rates of 10 feet to 40 feet per hour, an increase in weight of 100 percent results in a pentration-rate increase of 55 percent.

Penetration rates approximating 50 feet to 90 feet per hour are increased 50 percent with a weight increase of 100 percent. There is no doubt that critical limits exist for various formations and conditions, above and below which weight does not affect materially the penetration rate. It can be noted also that increased weight is more effective in hard formations than in soft ones. The softer formations are penetrated more rapidly by an increase in rotating speeds and fluid volume. However, within the limits of these various factors, it is far more desirable and important to have a proper distribution of weight, table speed, and fluid volume than to increase penetration by an excessive application of weight.

In one field in which experimental work was carried on, it was found that increased weight at the same rotating speed resulted in no appreciable increase in rate of penetration; but, by increasing the speed of rotation, the rate of penetration increased almost directly in proportion to increased speed for twice the usual weight—and the hole drilled straight,

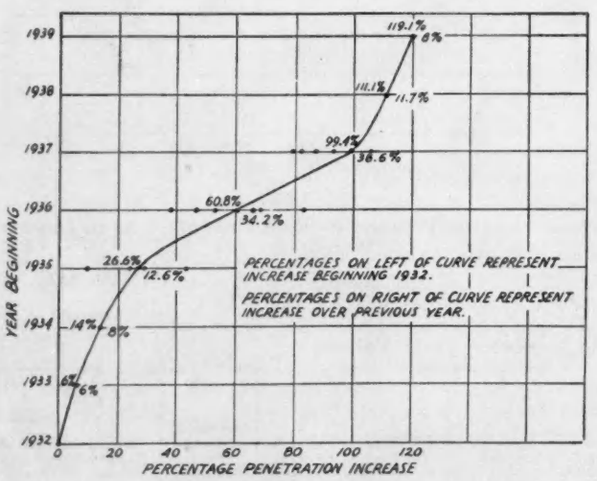


FIGURE 5

Rate of Penetration-Increase Trend—Graph Based on Penetration Rate of Various Fields in California, New Mexico, Wyoming, Kansas, Texas, Oklahoma, and Louisiana—(Curves of Averages).

which would not have occurred under the double weight at the slow speed.

Composite Trend of Penetration-Rate Increase

The year beginning 1932 was selected as the starting point upon which to base all penetration-rate increases. It was assumed that the 1932 penetration-rate increase was zero. Fields which did not have complete records as far back as 1932 began their percentage penetration-rate increase with the first year of their records. These rates were based on the average for that particular year of wells with previous records. Records from 22 fields and approximately 500 wells were studied to determine the average percentage penetration-rate increase during the past 6 years.

The graph resulting from this plot of years vs. percentage penetration-rate increase included many wells and fields that lagged in their response to improved drilling methods (see Figure 5). Many wells were drilled without attention being given to the proper table speeds, weight carried on the bits, fluid volume, or increased efficiency of personnel and

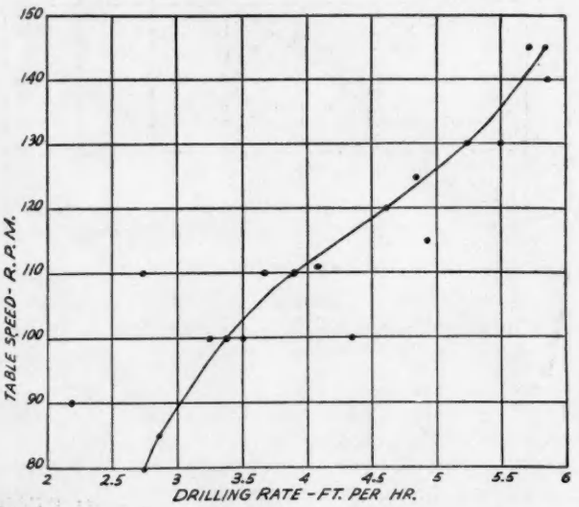


FIGURE 6

Graph Showing Penetration-Rate Increase Due to Increased Rotating Speeds with Various Fluid Volumes, Weight on Bits, and Including Improved Efficiency of Personnel and Equipment.

equipment. This graph is not expected to represent the total of detailed percentages resulting from the analysis of wells and fields used in the main body of this paper. The main reason for the graph is to show that, in spite of the many wells drilled by improper methods during the past 6 years, the penetration rate has increased by nearly 120 percent. The percentage increase is considerably higher when based only on those wells and fields that were drilled in accordance with up-to-date methods, and in some fields may amount to nearly 400 percent. Kettleman Hills, California, increased penetration through the brown-shale section by 385 percent in 3 years, from 1934 to 1937. Wyoming fields increased more than 110 percent from 1935 to 1938. West Texas and New Mexico fields increased penetration through the lime section by nearly 75 percent in 2 years, 1936 to 1938. A correspondingly high percentage penetration increase was noted also for the Texas Gulf Coast and Louisiana fields during the past five years.

Trend of Penetration Rate Including Influencing Factors

In order to show the trend of penetration rate as it actually exists with all accepted influencing factors combined, graphs have been plotted to represent each of the three general sections in Wyoming, Texas, New Mexico, and California. These graphs have been plotted to show the result of penetration rate vs. table speed; but augmenting the penetration rate are those influencing factors of fluid volume, weight on bits and equipment, and personnel.

It can be seen that all but four wells plotted in

TABLE 4

Penetration-Rate Increase Due to Increased Rotating Speeds (Los Angeles Basin)

DATE		Fluid Volume (Gallons Per Minute)	Character of Fluid (Weight Lb. Per Cu. Ft.)	Table Speed (Revolutions Per Minute)	Weight on Bit (Tons)	Length of Drill Collar (Feet)	Type of Feed	Bit Size (Inches)	Number of Bits	Depth of Interval (Feet)	Hours Rotated	Feet Per Hour
Year	Mo.											
1935	5	500	72	85	3–7	80	Brake	9⅞	95	5,754	1,993	2.89
	5	500	72	80	3–7	90	Differential	9⅞	83	5,740	2,085	2.75
	10	500	69	87	2–5	90	Differential	9⅞	95	5,735	2,163¼	2.18
	12	550	69	112	2–6	90	Brake	9⅞	67	5,184	1,270	4.08
1936	3	550	71	110	2–4	90	Brake	9⅞	106	5,417	1,957	2.77
	3	550	71	100	2–5	90	Brake	9⅞	88	5,327	1,640	3.25
	4	550	71	100	2–6	98	Brake	9⅞	88	5,411	1,545	3.50
	5	550	71	110	3	150	Brake	9⅞	81	5,215	1,424	3.67
	7	550	72	110	3–7	98	Brake	9⅞	79	5,312	1,362	3.9
	8	600	72	145	6	180	Brake	9⅞	59	5,314	922½	5.76
	9	600	72	120	3–7	98	Brake	9⅞	68	5,476	1,190	4.60
	9	600	73	130	6	88	Brake	9⅞	73	5,418	985	5.50
	10	550	73	130	3–5	180	Brake	9⅞	67	5,429	1,013½	5.26
	11	750	73	100	3–7	180	Brake	9	65	5,450	1,276½	4.37
1937	1	620	73	125	3–7	180	Brake	9	68	5,322	1,099¼	4.85
	4	600	72	140	2–6	140	Brake	9	73	5,387	921	5.85
	6	620	73	115	3–6	180	Brake	9	83	5,434	1,099¼	4.94

Figure 6 follow the general trend of the curve (see Table 4). One of these wells necessarily was drilled slowly because of a crooked hole; another lost the cones off a bit, and the average rate of penetration for this well included the time necessary to mill up these cones. Data on the remaining two, which were drilled in an exceptionally rapid manner, do not give any indication why their penetration rates are greater than the average.

In Figure 7 (see Table 5) all wells but one seem to follow the general trend of the plotted curve. This particular well was drilled on a structural position that was admittedly inconsistent with the drilling conditions of the field in general and, as a result, its average rate of penetration was considerably greater than that of other wells. The curve in Figure 8 (see Table 6), representing penetration rate with other influencing factors, shows that from a table speed of 80 to 100 or 110 r.p.m. the rate of penetration increases, but that above this limit of table speeds the penetration rate decreases. The interval through which these penetration rates were established is a very hard and consistently uniform lime. It may be possible that, because of the nature of the formation, a table speed greater than 100 or 110 r.p.m. will cause the cones of the bit to rotate in position without breaking or cutting the lime, and even will decrease the penetration rate because of increased table speeds. It is possible also that this reversed condition could be influenced by the lack of sufficient fluid volume necessary to remove the lime cuttings and, as a result, requires a secondary breaking of cuttings before they can escape the teeth of the bit.

It seems probable that the first of these is correct, and that rock of a certain character requires an appreciable amount of time for a bit tooth to effect breakage. At slow rotating speeds, the chips or cuttings are definitely coarser than at higher speeds.

It is also quite well established that in lime intervals similar to those from which data for this curve

TABLE 5

Penetration-Rate Increase Due to Increased Rotating Speeds (Kettleman Hills)

DATE		Fluid Volume (Gallons Per Minute)	Character of Fluid		Table Speed (Revolutions Per Minute)	Weight on Bit (Tons)	Length of Drill Collar (Feet)	Type of Feed	Bit Size (Inches)	Number of Bits	Depth of Interval (Feet)	Hours Rotated	Feet Per Hour
			Weight (Lb. Per Cu. Ft.)	Viscosity*									
Year	Mo.												
1931	3	400	..	..	50	¼–1	..	Brake	12¼	37	1,135	1,183	0.96
	3	400	..	..	50	¼–1	..	Brake	12¼	34	1,054	845	1.2
1932	9	400	..	..	80	¼–1	..	Brake	12¼	..	752	504	1.5
1933	5	400	..	..	70	¼–1	..	Brake	12¼	26	1,162	784	1.5
	12	400	..	..	70	¼–1	40	Brake	12¼	27	1,582	976	1.6
1934	1	400	..	..	70	½–1¼	40	Brake	12¼	36	1,690	1,232	1.4
	1	400	..	..	110	¼–1¼	40	Brake	12¼	29	1,701	858	1.9
	4	500	..	..	100	½–2	40	Brake	12¼	..	1,508	848	1.78
	11	500	74	35	70	1½–2½	40	Brake	12¼	19	1,103	932	1.2
	6	500	77	35	80	2–2½	40	Hydraulic	12¼	16	1,486	818	1.8
1935	2	400	75	45	90	¼–1¼	40	Hydraulic	12¼	36	1,624	1,179	1.4
	5	550	74	32	125	2–2½	80	Hydraulic	12¼	21	1,347	790	1.7
	7	550	75	31	150	1½	80	Hydraulic	12¼	15	1,250	428	2.9
	9	650	75	28	150	¼–1¼	40	Brake	12¼	27	1,538	481	3.2
	10	700	73	30	170	2	99	Hydraulic	12¼	12	1,206	368	3.3
	11	650	81	38	100	1	99	Hydraulic	12¼	24	1,324	965	1.4
	12	750	73	32	150	1½	86	Hydraulic	12¼	13	1,279	305	4.2
	12	750	74	36	140	2	96	Hydraulic	12¼	12	1,270	447	2.9
1936	1	700	73	40	130	1¼	80	Brake	12¼	30	1,550	812	1.9
	3	750	74	32	175	1½	126	Hydraulic	12¼	12	1,213	342	3.6
	3	750	79	37	150	¾	148	Hydraulic	12¼	19	1,246	484	2.6
	5	750	83	42	130	¾	105	Hydraulic	12¼	21	1,451	953	1.5
	5	550	73	..	210	½–2	..	Brake	12¼	..	1,675	396	4.3
	10	750	73	32	160	2	138	Hydraulic	12¼	16	1,586	523	3.1
	1	750	77	25	125	1¼	80	Hydraulic	12¼	22	1,485	689	2.2
	1	750	74	..	150	½–2	..	Brake	12¼	..	1,612	557	2.9
1937	1	750	73	30	200	½–2½	80	Hydraulic	12¼	12	1,562	374	4.2
	7	750	75	30	210	½–2½	..	Brake	12¼	..	1,656	381	4.3

* Viscosity by Marsh method; 500 ml. in and out.

were selected, any excessive table speed is highly detrimental to the longevity of drill pipe. It may be, therefore, that knowledge of this fact accentuated the importance of additional care and sacrificed increased penetration rate for safety.

This interval of bit penetration includes the lime production of various fields; and, as different methods are employed in drilling through the pay section, it

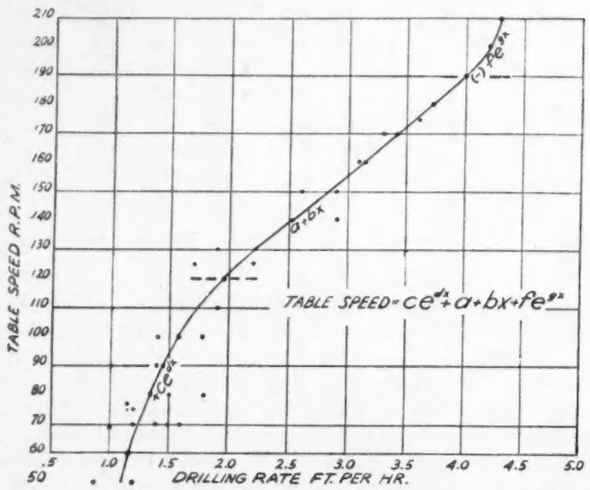


FIGURE 7

Graph Showing Penetration-Rate Increase Due to Increased Rotating Speeds with Various Fluid Volumes, Weight on Bits, and Including Improved Efficiency of Personnel and Equipment.

is reasonable to believe that the figures upon which the graph is based are not entirely results of what can be accomplished, but also include results of what are seemingly the best methods of completion.

It is noted that critical table-speed limits exist for various fields, and the greatest percentage increase in drilling rates comes between these limits. The penetration-rate increase continues as the table speed increases, but it does not do so in proportion to that increase between the critical limits, i. e. (see Figure 7) the penetration rate increases 0.83 feet per hour (from 1.12 to 1.95 feet per hour) with a table speed increase of 70 r.p.m. (from 50 to 120 r.p.m.), but the increase is 2.05 feet per hour (from 1.95 to 4.0 feet per hour) from 120 to 190 r.p.m. Above 190 r.p.m. it appears that the penetration-rate increase is not so greatly affected as it is between the critical speeds of 120 to 190 r.p.m. The same weights on bottom and other factors were the same in the field selected for Figure 7. Similar critical table speeds can be selected from Figure 6.

The percentages that have been used in this paper were derived from over-all figures; and, although they may not follow the various curves exactly, they are well within practical limits.

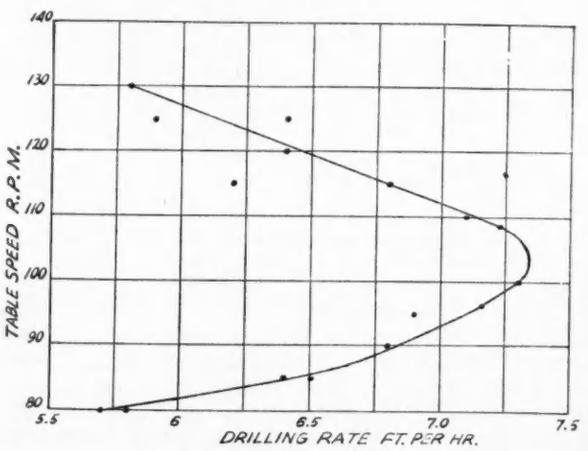


FIGURE 8

Graph Showing Penetration-Rate Change Due to Increased Rotating Speeds with Various Fluid Volumes, Weight on Bits, and Including Increased Efficiency of Personnel and Equipment—Intervals Similar to the Producing Lime of Texas and New Mexico.

The straight-line graphs follow the general equation $y=a+bx$; a and b are constants depending upon the nature of the formations to be penetrated and types of physical equipment used in penetrating these formations. The curves follow the general equation $y=a+bx+ce^{dx}+fe^{gx}$; where y=table speed, x=penetration rate; a, b, c, d, e, f, and g are constants peculiar to a particular field, and may be determined from a knowledge of drilling conditions of the field. Referring to Figure 7, an analysis of the curve and general equation showed that between table-speed limits of 50 to 120 the rate of penetration increase was less than between the limits of 120 to 190; it was also found to be less after a table speed of 190 r.p.m. had been reached.

Summary

During the course of the studies on which the foregoing observations are based, the authors used a total

TABLE 6

Penetration-Rate Change Due to Increased Rotating Speeds (Permian Basin)

DATE		Fluid Volume (Gallons Per Minute)	Character of Fluid		Table Speed (Revolutions Per Minute)	Weight on Bit (Tons)	Length of Drill Collar (Feet)	Type of Feed	Bit Size (Inches)	Number of Bits	Depth of Interval (Feet)	Hours Rotated	Feet Per Hour
Year	Mo.		Weight (Lb. Per Cu. Ft.)	Viscosity*									
1936	11	550	75	..	130	10–13	80	Brake	7¾	7	602	104	5.8
	12	550	75	..	80	7½–12	80	Brake	7¾	8	627	110.5	5.7
	12	550	75	..	120	10½–11½	80	Brake	7¾	10	632	112.5	5.6
1937	2	750	75	..	100	6½–8½	90	Brake	7¾	9	664	90.5	7.3
	2	650	75	..	115	13½	80	Brake	7¾	8	657	105.5	6.2
	3	550	78	..	120	9–13	80	Brake	7¾	9	660	104	6.4
	3	600	67	..	125	12–14	125	Brake	7¾	9	602	94	6.4
	4	750	77	..	95	4½–12	80	Brake	7¾	10	591	86.25	6.9
	4	650	72	..	110	10–12	80	Brake	7¾	7	601	85	7.1
	4	700	72	..	125	10–16	80	Brake	7¾	9	607	102.25	5.9
	5	700	72	..	85	7–14	80	Brake	7¾	9	598	91.5	6.5
	5	700	79	..	85	8½–9½	80	Brake	7¾	10	640	100	6.4
1938	6	700	72	..	90	8–10	80	Brake	7¾	9	697	102.5	6.8
	7	550	..	..	80	4–6	30	Brake	4¾	4	417	72	5.8
	8	400	..	..	115	2	..	Brake	4¾	2	140	20.5	6.8

* Viscosity by Marsh method; 500 ml. in and out.

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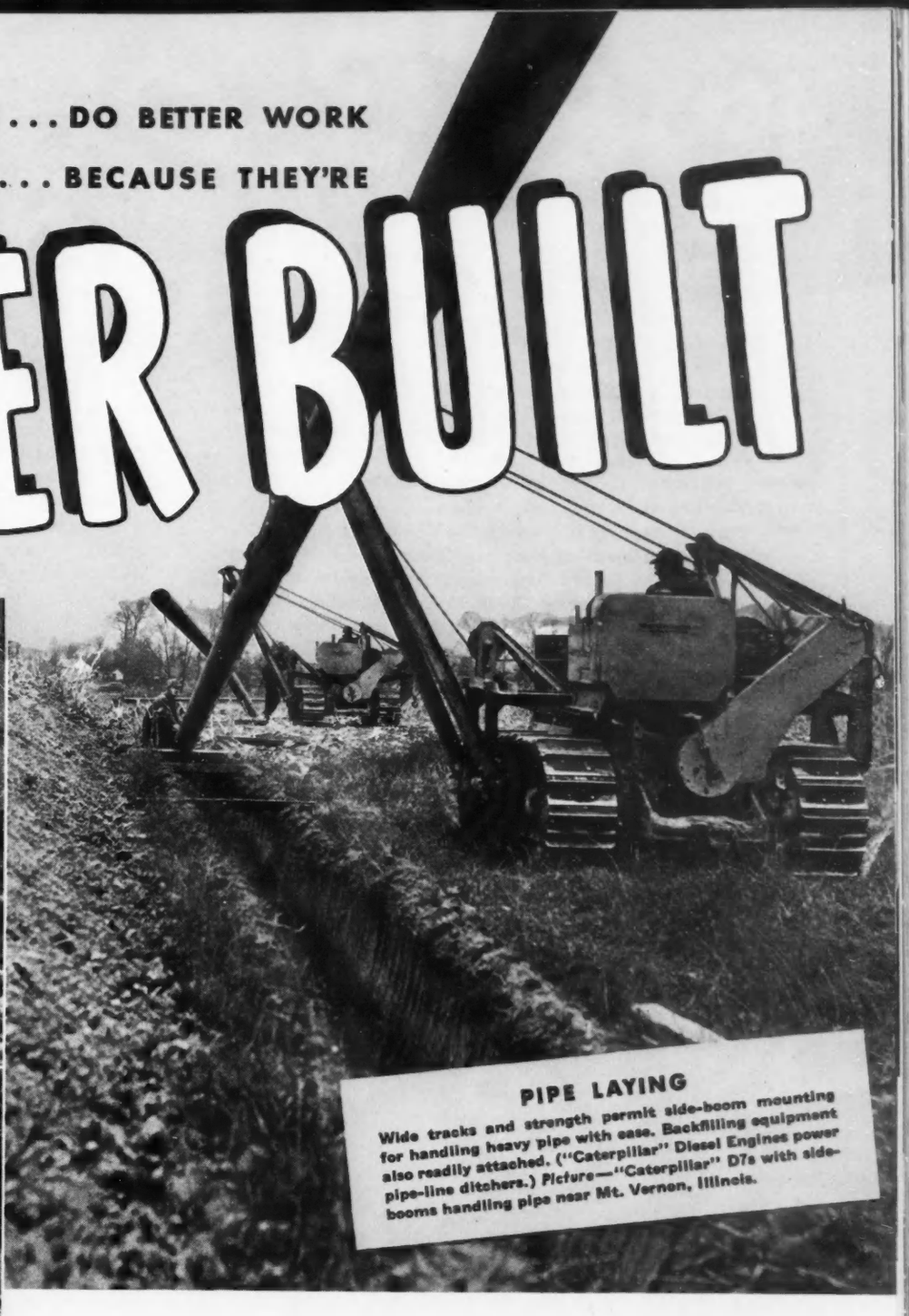

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of somewhat in excess of 500 records of rotary wells selected from several Gulf Coast areas; 2 or 3 Oklahoma fields; the Permian Basin of West Texas and New Mexico; and the states of Wyoming and California. Many of these well records were divisible into two or more parts, based on dissimilarity of drilling conditions in vertical horizons in the particular field. Thus, for all practical purposes, there were available an excess of 500 data sheets. This information was furnished in reply to a questionnaire sent to the drilling departments of a number of major oil companies, and smaller operators and contractors. In most cases, these organizations cooperated very fully and thoroughly, and the authors are indebted to them for rendering the study possible.

The endeavor has been to show, in percentages, the effect of each of four factors on the rate of penetration of the rotary-drilling bit into the formation. It must not be assumed, however, that the answers to the several problems are more than remotely correct, or that they do more than indicate tendencies. In fact, despite the detail with which the studies have been made and the niceties to which the calculations have been carried, they merely suggest the importance of the parts played by the several factors. The results are as follows:

	(Percent)
Personnel and equipment	55.5
Rotating speed	39.6
Drilling fluid, volume	28.6
Weight on bit	included in above figures
Total	123.7

Thus we find that within the past several years the increased rate of penetration for the groups of wells selected amount to 123.7 percent. In Figure 5 there has been drawn a graph based on the penetration rate in various fields in California, New Mexico, Wyoming, Kansas, Texas, Oklahoma, and Louisiana, from 1932 to the present time. This study indicates an over-all increase in rate of penetration of 119.1 percent. These two figures were obtained in quite a different manner, and are suggestive at least of the value and practical accuracy of the results obtained.

Conclusions

The data assembled indicate that the efforts of operators to increase the efficiency of rotary-drilling operations have been reasonably successful, and that the basis for this increased rate of penetration may be accounted for somewhat as follows:

1. Of the three factors for which presented figures were determined, all of which include the one factor of "weight on bottom," that factor of personnel and equipment is quite the most important. It was found to be impossible to separate these two because of the impracticability of recording progress data for which these two items are responsible. It appears that what herein is called "personnel" has had a very material effect on increased drilling efficiency because of the fact, that within the years covered by the investigations, the direction of most drilling operations and drilling practices has been under the control of individuals who have specialized in the various problems encountered in the drilling operations, and have set their requirements of the drilling crews in accordance therewith. In other words, to speak plainly, within this period the operations have passed from rule-of-thumb methods in drilling wells to practices based on sound engineering and technical considerations. It is indicated likewise by the studies that a fair beginning only has been made in this direction, and that opportunities for further improvement are still plentiful.

   It is assumed that increased efficiency due to improved equipment is accounted for largely by better material and design of bits, and better methods of using drill pipe, as well as improvements in metal and joints of the pipe—permitting the drilling shaft to labor more severely without undue fatigue. It seems apparent that there are still enormous opportunities for improvements in drilling efficiency through better bit design and through the use of drill pipe that is capable of more severe labor. Splendid work now is being done in the latter respect, but probably operators are inclined too much to accept what is given them in drilling bits rather than to study the problem for themselves and to require tools of types which apparently would serve the purpose more efficiently.

2. Next in importance, and still including weight on the bit, is "rotating speed." It has been shown that there are critical limits between which the increased rate of penetration plotted against rotating speeds in a straight line. Beyond this speed limit, at least in the available records, the rate of increase in penetration of the bit increased less rapidly than in the straight-line curve. This is shown in Figures 6, 7, and 8. It appears from many records that the decline in the rate of increase (except in hard-limestone formations) is occasioned by an insufficiency of certain of the other factors. These data indicate that, with an increase of rotating speed above a certain critical rate, there must be a corresponding increase in fluid volume and weight on bottom in order to maintain a proportional increase in the rate of penetration. In other words, in those formations which are drilled with rock bits, but which are relatively soft non-plastic strata, a 10⅝-inch bit through which 750 gallons per minute of drilling fluid is passed, and on which 6 or 8 tons of weight is carried, will increase in rate of penetration as a straight-line curve to about 200 r.p.m. If the fluid volume is increased to 860 gallons per minute and the weight on the bit to 8 or 10 tons, the rate of penetration will continue to increase as a straight-line curve to a speed of 350 to 400 r.p.m. These speeds seem to be the upper practical limits, at least for reasonably deep holes, at the present time. Beyond these speeds it is difficult to hold the equipment together, and probably the drill pipe is subjected to more severe labor than it can withstand without undue fatigue and premature failure. Drag bits operating under the same conditions as outlined above,—the exception being in plastic formations or gumbos—seem to show a like rate of increase with a like increase in the values of the various factors—although the data in this regard are not as complete as might be desired and are, in consequence, quite inconclusive.

3. The data collected indicate that in formations softer than those which generally are called "rock," the upper limit of fluid volumes has not been reached, insofar as rate of penetration is concerned, for holes of 10⅝-inch size and larger. Any hard-rock formation apparently would re-

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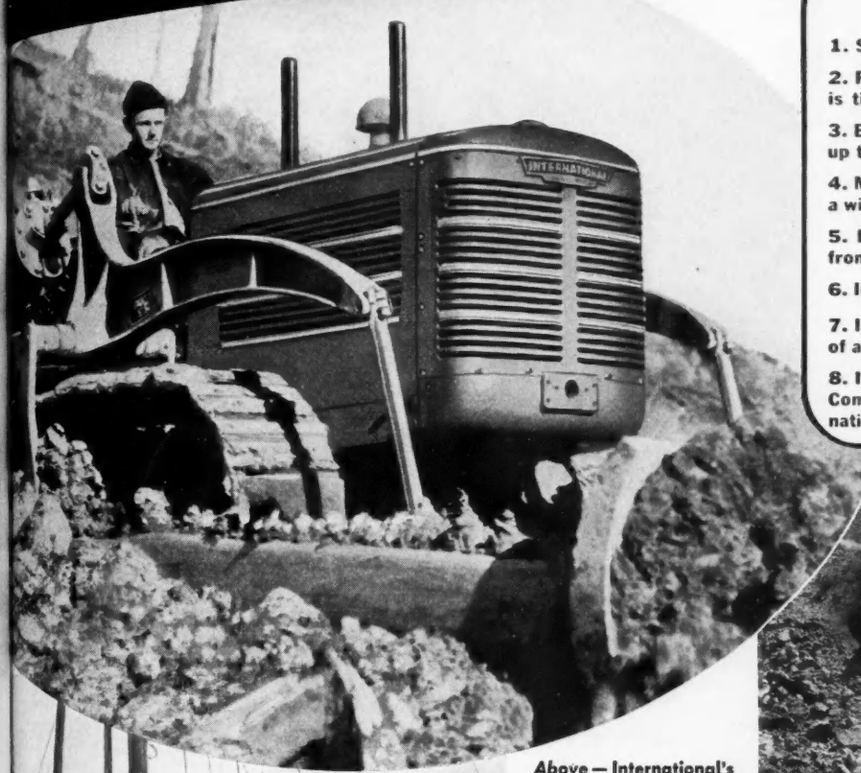

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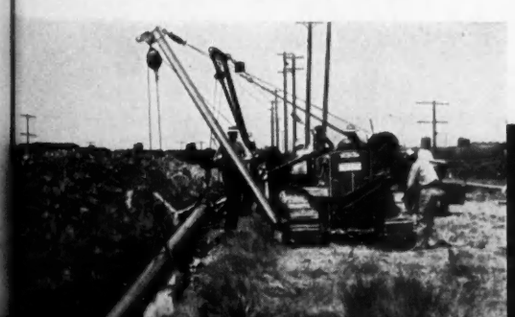

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quire sufficient fluid volume jetted at high velocity against the bottom of the hole to remove the cuttings as made from beneath the forward direction of the rolling cutters of the bit. An increase in this volume does not seem to improve the rate of penetration; however, it is admitted that the most of these data are for relatively small holes—although there is much information on 12¼-inch bores which seems to bear out the theory. It seems to be quite important—at least in clayey, silty, and shaley formations—that the mud-laden fluid be maintained at a solid percentage well below its point of saturated fluid suspension.

4. Although the assembled data did not include sufficiently positive information to permit the determination of penetration increase based on weights, there are certain very definite indications which are:
   a. In certain types of formations (such as brittle shales, concoidal fracturing limestones, and gumbos) there is a definite limit to the weight that may be used efficiently and above which the rate of penetration actually will decrease.
   b. There are other formations (such as limestones with angular fracture, salt, very hard sandstones or quartzites, and igneous rocks) in which the rate of penetration will increase practically as a straight-line curve with the increase of weight on bottom to the practical limit of the bearings of the bit then in use. In this case, neither the rotating speed nor the fluid volume need be increased. As a matter of fact, rotating speed cannot be increased safely because of the vibrations set up in the drill pipe—subjecting it to fatigue and premature failure. There are other types of formations (such as soft sandstones or consolidated grits, sandy shales, and silts) in which again penetration will increase as a straight-line curve—provided the weight on the bit, fluid volume, and rotating speeds are increased proportionately. It is interesting to note also that one group of wells indicates that, if the weight on bottom is increased above a definite percentage of the total weight concentrated above the bit, the rotating speed likewise must be increased if a straight hole is to be maintained.

In these various discussions it is assumed that the holes are to be drilled within 3 degrees of the vertical Thus, in finality, it is concluded:

1. That, in hard-rock fields, increased rates of penetration depend upon the personnel and improvements in bits and drill pipe. Rotating speeds and fluid volumes apparently have reached their upper limits, as has weight on the bit in many cases.
2. That, in rock-bit drilling in relatively-soft material, increase in values of the four factors will result in an increased rate of penetration—although there undoubtedly will be maximum limits for all of these, with the exception of personnel.
3. In drilling formations of the above types, or softer, with drag bits, the same conditions apparently will obtain; i. e., by increasing the values of the several factors, an increased rate of penetration will result.
4. In plastic formations, brittle shales, limestones having concoidal fracture, and some other somewhat similar formations, rate of penetration may be increased: by improvement in the personnel and bits; by increased rotating speeds to the practical maximum, and larger fluid volume, together with higher pressure jetting from the fluid nozzles of the bit. The weight on the bit may not be increased profitably.
5. In plastic, clayey, silty, and shaley formations, rate of penetration increases depend largely upon increased fluid volumes, jetting action of the fluid on bottom, and character of the fluid. The use of the proper type of short drag bits is assumed.

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THE SHIELD THAT SYMBOLIZES DEPENDABLE EQUIPMENT

Selective Exclusion of Fluids from Wells*

By PAUL D. TORREY,
The Sloan and Zook Co., Houston, Texas

THE preparation of this paper was sponsored by the Southwestern District Topical Committee on Production Practice. Valuable assistance has been received from other Institute districts and chapters. The paper is devoted primarily to modern methods which are employed in the completion of oil wells, and in re-working jobs when these may be necessary.

Squeeze cementing, which is used widely as a completion and remedial measure, is a process whereby cement slurry is forced, or "squeezed," under pressure into or against a permeable formation, either in open hole or through gun perforations in the casing. Breaking down the formation by water under high pressure before the cement is introduced seems to be a prerequisite to the success of squeeze cementing. It is believed that openings in the formation are formed by the water under pressure which provide spaces—sometimes of considerable size—in which the cement may lodge. Evidence is presented that would indicate that cement will set preferentially in a gas pay or a water sand rather than in an oil sand, and that the cement under ordinary circumstances does not have a detrimental effect on the oil sand.

Methods employed in squeeze cementing, without a cement retainer and with a cement retainer, are described. An interesting method for the testing of a deep wildcat well, without the running of a long string of casing, by cementing a short string opposite to the horizon to be tested is described. Also a description is given of a method that has been developed for the completion of a well producing from a series of oil sands through one string of casing.

Case histories in various fields of Texas, Louisiana, Arkansas, and Illinois, where squeeze cementing has been employed for the reduction of high gas-oil ratios and for the exclusion of water, are presented. Maximum squeeze pressures in excess of 3,000 pounds per square inch appear to give the best results for the reduction of high gas-oil ratios, and maximum squeeze pressures of approximately 4,000 pounds per square inch appear to give the best results for the exclusion of water. Squeezing in close proximity to the gas-oil contact or to the water-oil contact is essential. Squeezinz is generally much more effective through gun perforations in the casing than in open hole. Of the various records studied 44 percent were entirely successful in the reduction of high gas-oil ratios, and 61 percent

I. Introduction

AMONG the various functions of the Institute's Division of Production topical committees is the sponsorship of investigations which are designed to provide the oil industry with information that will be helpful in promoting more efficient drilling and production practice. A study of the results that have been obtained by "squeeze-cementing" operations and of the relative merits of well completion by gun perforation of casing or by the setting of conventional screens and liners first was proposed by the Southwestern District Topical Committee on Production Practice. Sufficient preliminary information was assembled by this committee to indicate that there were adequate data available to justify the preparation of a paper on these subjects. In order that a consideration of the new and interesting chemical methods of plugging also might be included within the scope of the paper, the title, "Selective Exclusion of Fluids from Wells," was suggested by the Topical Committee on Production Practice. This expansion in title also has permitted the utilization of much valuable information that has been developed by the East Texas Chapter and the Eastern, Mid-Continent, and California District Topical Committees on Production Practice; and to this chapter and district committees, and to the various members and speakers whose papers and other data have been combined with the study upon which this paper is based, the Southwestern District Committee is most appreciative. This paper, although not presented as a symposium, represents the combined efforts of the committee and of the representatives of various service companies. The chairman of the committee has acted as a clearing house for information that has been provided by the cooperative effort of a widely-separated group. To those producing and service companies who have assisted so generously in the committee's work, proper recognition will be given at an appropriate point.

II. General Statement of Subject Matter and Scope of Paper

From the earliest days of the petroleum industry holes have been protected from caving formations and from water originating in upper formations, and the oil and gas coming from underground reservoirs have been brought to the surface by and through the use of pipe. Casing, therefore, may be regarded as the primary material for the exclusion of fluids from a well, and consideration of casing in the terms of modern petroleum-engineering practice involves the manifold problems and methods of procedure whereby long strings of pipe are lowered into holes and held securely in a position where they will afford the greatest protection to the producing formation, or permit further drilling of wells to depths which otherwise would be unattainable.

* A contribution from the Southwestern District, Topical Committee on Production Practice, prepared with the active assistance and collaboration of the following committee members: W. A. Alexander, Shell Oil Company; D. V. Carter, Magnolia Petroleum Company; D. B. Collins, Shell Oil Company; R. O. Garrett, Arkansas Fuel Oil Company; H. H. Hardison, Standard Oil Company of Texas; G. L. Nye, Tide Water-Associated Oil Company; L. A. Ogden, The Pure Oil Company; T. W. Rhoads, Gulf Oil Corporation; W. E. Schoeneck, The Ohio Oil Company; and J. U. Teague, Humble Oil & Refining Company.

The use of casing in wells at once brings to our attention the application of cementing methods which have been developed over a period of years, to the point where they are now indispensable to the drilling and completion of deep wells. The crude seed-bag packers, which were employed during the development of the early Pennsylvania fields for the better exclusion of water, were probably the first refinement in the technology of well protection. From this humble beginning we can follow a continued improvement in methods up to the present time—when conditions, formerly not conceived, require widely-varying technique to permit the effective production of oil and gas, and the protection of the reservoirs from water.

It is not proposed in this paper to consider in any detail conventional methods that are used in the cementing of casing in wells. The procedure commonly followed generally is well-known, and has been the subject of a voluminous literature. It is purposed herein rather to devote attention principally to particular problems of well completion and subsequent remedial work, limiting the discussion of ordinary cementing practice to such reference as may be related to the specific question under consideration.

The bounds provided by the foregoing limitations established the following as the topics covered by this study:

1. The application of cementing and gun-perforating methods to the testing of deep wildcat wells.
2. Methods for the reduction of high gas-oil ratios.
3. Methods for the exclusion of water.
4. Various plug-back methods, with particular reference to problems encountered in the East Texas field.
5. A comparison of the results obtained by gun-perforated well completions with the results obtained from the use of conventional liners and screens.
6. Chemical plugging agents.

III. Discussion of Problems Involved in Cementing

The associated problems of the cementing of casing and the completion of wells are most varied, and in many instances are so dependent upon local conditions that references to actual field examples are necessary to indicate the degree of success attained. Regular cementing procedure provides much more than a means of holding pipe in the hole, although it is frequently apparent in the field that the variety of effects that result from cementing operations are not recognized adequately. To enumerate briefly some of these, it may be stated that oil-well cementing affords:

1. Protection to shallow oil- and gas-bearing formations which may be produced when deeper reservoirs have been exhausted.
2. Protection from contamination of shallow freshwater-bearing formations.
3. Protection to the producing formation from water originating in higher formations.
4. Protection against corrosion of the casing.
5. Protection against migration of oil, gas, or water from one formation to another.
6. The ability to remove larger sizes of pipe from the upper part of the hole which are set as a protective measure during drilling operations.
7. The facility of setting casing at any depth desired without regard to the total depth of the well.

Notwithstanding the difficulties involved in tracing the course of the cement after it passes the casing shoe, and the remoteness of the actual cementing operations, it is really surprising what a general degree of success accompanies oil-well cementing operations. Usually if the hole is in good condition and does not deviate too much from the vertical; if the mud is at the correct weight and viscosity; and if the surface connections are of adequate capacity and in good condition, a satisfactory cementing job may be expected.

Failures or unsatisfactory results in cementing operations may be due either to incorrect completion of the well at the proper level—thereby resulting in high gas-oil ratios or in water production—or to the physical condition of the hole, and to the preparation of the cement slurry. Failures of the first type will require various remedial methods—to the description of which a large part of this paper will be devoted. Some of the reasons for failures of the latter type are listed herein, with a brief discussion of the methods which have been employed most successfully for the correction of the same.

1. The presence of a thick section of clays and shales which will not form a strong bond with the cement, thereby requiring the use of considerably more than the calculated amount of cement in order to form a tight pack between the casing and the hole.

A study of drill cuttings and electrical logs will give some clue as to the necessity for extraordinary

were entirely successful in the exclusion of water. The employment of higher maximum squeeze pressures, gel types of cement, and multiple-batch jobs are increasing the percentage of success that is being obtained from squeeze cementing. The results from squeeze cementing may not be permanent when there will be readjustments in the gas-oil and the water-oil contacts in the reservoir.

Various plug-back methods for the exclusion of water are described, and particular reference is made to results that have been obtained in various West Texas fields, in the Rodessa field, and in the East Texas field. No squeeze-cement job for the exclusion of water has been entirely successful in the Permian lime fields of West Texas. In the Rodessa field very good results have been obtained by cementing a short string in the bottom of the hole and then gun-perforating for production. Many plug-back methods have been used in the East Texas field, but no one method appears to be universally applicable. Past experience has shown that about 50 percent of the attempts made have resulted in failures. New technique in placing the cement so that the casing may be protected from excessive pressures, and the use of gel types of cement, have indicated more promising results.

Owing to low allowables and the use of small-size chokes, there does not seem to be any great difference in the productivity of wells completed by gun perforation and of wells completed by the setting of conventional liner and screen. Gun-perforated well completions permit a close control of oil production, and provide an easy means for remedial work at some future time. Completions by setting screen and liner may result in larger ultimate oil recovery, and are used widely in thick-sand sections where there is no question as to the water-oil or gas-oil contact.

New chemical methods for the exclusion of water are assuming considerable importance. Two different processes are described, and some of the results that have been obtained are listed. The gel-plugging agent has been applied very successfully in hard-rock fields for the exclusion of water.

This paper was presented at Ninth Mid-Year Meeting, American Petroleum Institute, at the Roosevelt Hotel, New Orleans, La., May 18, 1939. (The statements and opinions expressed herein are those of the author, and should not be construed as an official action or opinion of the Institute nor of this publication.)

amounts of cement. It may be regarded as being good precautionary practice to have an ample reserve of cement available at the time of completion of wildcat wells when the main section of formations, in which the pipe must be set, consists largely of clay and shale. The experience gained at the time of completion of the first well in a field will be a valuable guide for succeeding operations, particularly when the heights that the cement has reached on the outside of the casing have been determined by temperature measurements.

2. Contamination of the cement slurry by mud and the disintegrating effect of waters carrying magnesium sulfate.

Except under most unusual circumstances, there is little excuse for troubles from mud contamination in modern cementing practice. The mud should be conditioned thoroughly before the casing is run, and should be circulated sufficiently to provide a uniform consistency. The effect of sulfate-bearing waters may be eliminated partly or entirely by the use of gel types of cement and cement definitely resistant to waters of this type.

3. High temperatures which promote a rapid set of the cement.

This problem is one of great importance in the completion of deep wells. Slow-setting cements generally are used under these conditions. In addition, it has proved to be advantageous in some circumstances to cool the mud that is being circulated through the pipe before cementing is commenced, thereby lowering the temperature of the pipe itself—which will tend to keep the cement cool. Ice water also has been used for the mixing of the cement slurry—thus producing similar results.

4. Crooked holes which do not permit centering the pipe in the hole, thereby being responsible for an unequal distribution of the cement around the casing.
5. Channeling of the cement due to irregularities in the size and shape of the hole.

If the hole is known to be crooked, and if irregularities in size and shape are suspected, the use of a co-axial spiral, consisting of a triangular section of rubber vulcanized to a steel base which then is welded in the form of a helix to the outside of the casing, will tend to center the pipe and provide an effective distribution of the cement at critical points in the hole. Rotating the pipe, while the cement is being placed, will help to provide an equal distribution; but this is impractical in deep holes, and it is much easier in effect to rotate the upward advance of the cement by the use of the co-axial spiral.

6. Variable weight of slurry and too light-weight slurry resulting in incomplete water shut-offs and in weak points in the cement bond.

This is inexcusable, and can be prevented by careful weighing of the slurry at regular intervals while it is being mixed, and by rejecting material that does not conform to the desired weight. The proportions of water and cement, as the case may be, readily can be changed while the cement is being placed.

Notwithstanding the experience that has been obtained from thousands of well completions in controlling physical difficulties which may accompany cementing operations, failures from this source sometimes do occur. Corrective measures that may be applied under such conditions are similar or identical to the methods which may be used to improve high gas/oil ratios and to exclude water.

IV. Theoretical and Experimental Considerations Involved in Squeeze Cementing

Squeeze cementing is a method whereby cement slurry is forced, or "squeezed," by pressure into or against a permeable formation, or through perforations in casing or liners, at predetermined points for the purpose of reducing gas/oil ratios or for the shutting off of water.

All of the reasons for the effects that have been obtained from squeeze-cement jobs cannot be demonstrated definitely. In fact, certain of the questions involved in squeeze cementing still are of a controversial nature. On account of this situation, it appears desirable in the beginning to discuss some of the factors which appear to be responsible for squeeze-cementing action, before attempting to describe the actual methods of application, and before presenting some of the results that have been obtained.

As a preface to this particular topic, it should be pointed out that, although squeeze cementing cannot be classified exactly as a new method, the procedure which now generally is followed differs in many respects from the various other plug-back methods which have been used formerly in an endeavor to attain the same results. In the past the pressures that have been applied have been limited to the pressure that safely could be placed on the entire string of casing or on a production packer. At the present time this is overcome to a marked degree; and the limit of pressure that now may be used is determined by the capacity of the pumps, the power (such as steam pressure available), the strength of the tubing or drill pipe through which the cement slurry is pumped, and the bursting or collapse strength of the casing in the immediate zone to be squeezed. The development of the cement retainer, which permits the placing of the slurry through the tubing under pressure instead of imposing the placement pressure directly on the casing, has proved to be an important factor in the improvement of the process of squeeze cementing. Although much has been learned in recent times regarding the results that may be anticipated, it cannot be said that a definite explanation can be produced for all of the effects that may be observed at the time the squeezing is done and after the cement has been placed at the point desired. Careful observation of the pressures required and volumes of cement used for successful squeeze cementing, and an analysis of the results obtained under widely-varying conditions, provide some very definite clues as to what actually happens when cement is squeezed against a permeable formation. In addition, it is possible to compare some of the pressure and volume effects encountered in squeeze cementing with facts which have been established in the artificial water flooding of oil sands, and thus by analogy arrive at some conclusions regarding the action of squeeze cementing.

It has been recognized for some time that one of the essential elements in the success of many squeeze-cementing operations is the breaking down of formation resistance with acid or water under high pressure before the cement is placed. Usually the pressure that will be required to force water into an undepleted or partly-depleted reservoir will be greater than the actual bottom-hole pressure at the time of application. The initial breakdown pressure is, in many instances, from 50 to 100 percent greater than the bottom-hole pressure; and when this breakdown pressure is imposed on the sand, great quantities of fluid can be

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introduced as long as the pressure is maintained. However, after movement of the water into the formation once has been established, the pressure generally decreases. If, for some reason, the pump should be stopped, and then, at a later time, pumping again be resumed, the pressure required to introduce the water usually will be approximately the same as the original breakdown pressure. After a steady flow of water has been established and the pressure reaches a constant minimum, the well then is regarded as being in condition for squeezing. The reason for the decline in input pressure has been attributed variously to an actual increase in the permeability of the formation and to the formation of channels through which the water will move more readily. It also has been suggested that the inertia of the static condition of the well might be a possible reason for this phenomenon.

By inference, from the results that are obtained, it seems that the water under pressure selectively will go into a porous formation already saturated with water or gas with greater ease than it will go into an oil pay. This hypothesis may not be in exact conformity with the time-honored conclusion that water moving through an oil reservoir will drown out wells located in the path of its migration, and thus cause them to cease producing oil. This, of course, is the case when the water actually is displacing the oil; but if the water is moving through a pay all of its own, there is no plausible evidence to show that the drowning out of the well is due to the penetration of the oil pay by the water, or that the oil content of the sand in the vicinity of the well affected has been decreased by any appreciable measure. Without having to resort to physical or mathematical calculations to support this view, it is fortunately possible to present evidence that water will avoid oil pay in preference to water pay or gas pay, and the proof of this statement may be found in the results that have been obtained in the artificial water flooding of oil sands.

As an example, it may be cited that in certain of the high-structural areas of the Bradford field, where the upper part of the sand is gas pay and the lower part of the sand oil pay, it is impossible to flood the oil pay effectively unless the gas pay is packed securely and cemented off, notwithstanding the fact that the porosity and permeability of both pays are essentially identical. Furthermore, it may be pointed out that the water will enter the gas pay very readily, and in large quantity, without the benefit of explosives; whereas it is necessary to shoot the oil pay heavily with nitroglycerin before it will take appreciable quantities of water. In further proof of this contention, it is a well-known fact that in certain areas of the Bradford field, where the gas pay is not packed and cemented off, the water will migrate in large quantity from the intake well to the producing well—a distance usually more than 200 feet—in a period of only a few weeks; but if the action of the water is confined to the oil pay, its movement is restricted to a few inches per day—and thus it usually requires a period of from 18 to 20 months before the water appears at the oil well. As final confirmation, it can be stated that water will move through the gas pay under very low pressures, but that in oil pay of practically the same permeability it frequently requires twice the normal hydrostatic pressure to force any appreciable water movement through the sand.

In like manner, it can be shown from the experience that has been obtained from water-flooding operations, both in the Bradford field and in fields in northeastern Oklahoma, that water under pressure will move much more readily into a sand that already is saturated with water than it will into a sand that is saturated with oil. In the southern part of the Bradford field, where the lower part of the sand carries salt water and the upper part of the sand carries oil, the water-intake wells are never drilled entirely through the oil pay; and if by mistake the wells are drilled too deep in the section, they are plugged back carefully to keep the input water out of the water-bearing sand. It has been demonstrated time and time again that the intake water, if given an equal opportunity, will go into the water pay with great rapidity and leave the oil pay relatively unaffected.

The foregoing evidence shows that the application of water under high pressure, as a preliminary step before the actual squeezing of cement into a water pay or a gas pay, probably will not have a harmful effect on the oil pay; inasmuch as the penetration, if any, in the oil pay will be very slight during the relatively short time in which the water is being introduced. For the reason, in all likelihood, the oil pay is affected only slightly by water penetration, it would follow naturally that the increase in the capacity to absorb water—which results from the original breaking-down operation—takes place in the water pay or the gas pay, as the case may be, and thus provides a better avenue for the subsequent introduction of the cement slurry into the very parts of the formation which it is desired to shut off.

What physical changes take place in the sand to increase its permeability—or, as we might say more properly, its capacity to take fluid as the water pressure is applied—are in part a matter of conjecture. In all probability several factors are involved.

Increases in permeability presumably would occur where the size of the original pore spaces is increased; and increases in the capacity of the formation to take water could be attributed to the dislodgement of particles or pieces of sand, or to the actual separation of beds in the sand, to form cavities or channels of larger size than the normal openings. These could be formed by the following causes:

1. The disintegration of the sand by the action of water.
2. Erosion by the action of the water and by excessive free gas.
3. Structural changes in the sand body due to the high pressures exerted during the introduction of the water and the cement slurry, which may consist of an actual fracturing of the formation along bedding planes or sedimentary planes of weakness—thereby forming openings in which the cement may lodge.

The disintegrating effect of water on the binding material that holds the sand grains together, which in many cases consists of clay minerals, can take place in three different ways. The first way consists of an actual softening and loosening of the clay, making it at first somewhat plastic and then subsequently breaking the material down to the point where it will go into suspension in the water, and thus loosen and dislodge the sand grains. The second way involves a molecular combination of the water with the clay minerals, thus causing the clay particles to expand in size, and by so doing breaking the sand grains away from their former position in the bed. The third way lies in the solution of mineral salts, which so commonly are found precipitated in marine sands—thereby increasing the effective porosity of the same. The extreme pressures applied naturally will facilitate all of these actions.

The foregoing effects probably are not so important when the water is being forced into a part of

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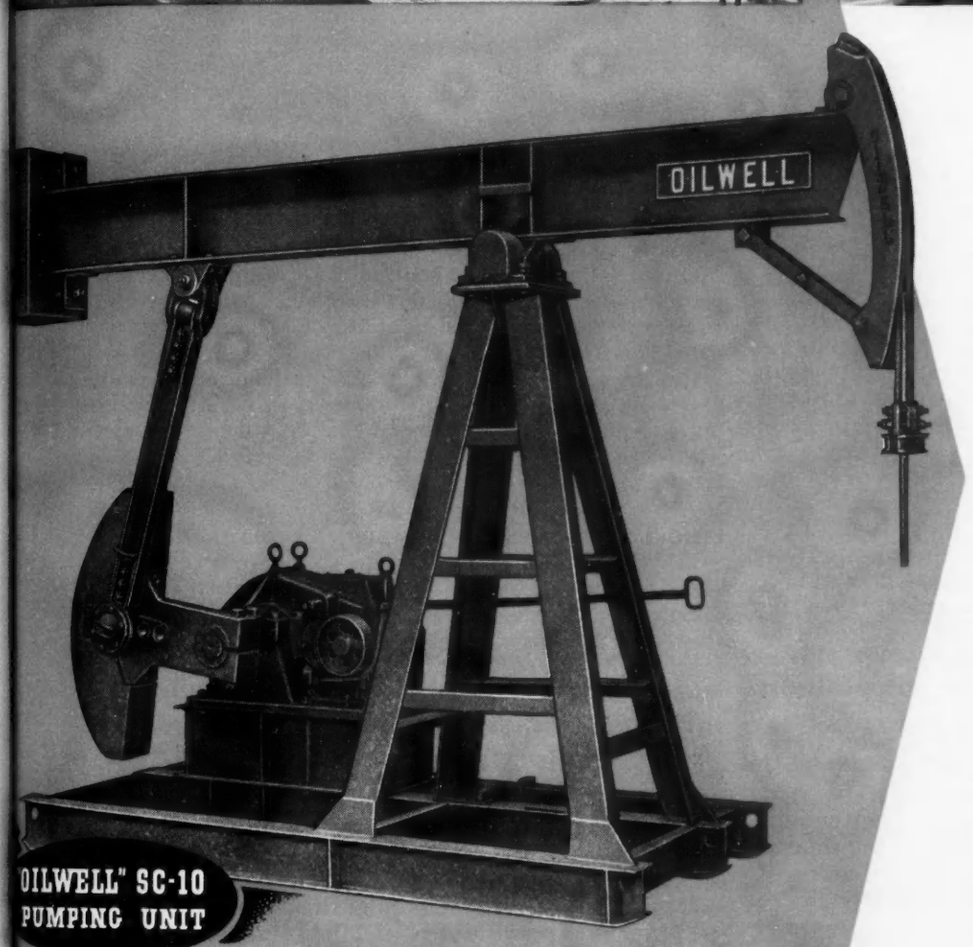

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the formation that is already water-bearing; but it may be presumed—and this can be confirmed amply from a comparison of cores of oil-, gas-, and water-bearing sands—that the water sands generally are more friable, owing to the effects just mentioned. Oil or gas will not have these effects on the physical structure of the formation.

The effects of softening, molecular expansion, and solution will not be so apparent in limestone reservoirs, owing to their greater strength and to the difference in their chemical composition. It is for this reason that acid, instead of plain water, is used frequently in limestone fields to enlarge the pore spaces by solution, prior to the introduction of the cement.

Erosion by water flowing through the sand into the well provides a means of transportation for the sand and clay particles which have been broken away by the various actions previously referred to. That this actually takes place can be verified by the history of a multitude of sanded-up wells. In somewhat like manner, sand grains may be dislodged from the gas pays and carried into the well by the violently-expanding gas, which may have an almost explosive effect when it approaches the point of release from its reservoir.

That structural changes do occur in the sand, other than those which just have been described, is indicated by the large amounts of cement that frequently are required to squeeze successfully into a particular formation. Additional open spaces may be formed by the washing-back effect of the water as it first is introduced, and by actual compaction of the formation under severe pressure. The most plausible explanation, however, for the frequently great increase in the capacity of the formation to take fluid, after high water pressures have been applied, and in the enlargement of spaces in which great quantities of cement may be packed, appears to depend upon the rupturing or breaking apart of the formation along bedding planes or other lines of sedimentary weakness. That this can take place is indicated by the experience obtained in back-pressuring and flowing operations in connection with artificial water flooding. It has been established in the Bradford field that there is a critical pressure above which flooding action will not take place; and when this pressure is exceeded, the water will rush through in large quantities from the intake well to the producing well—bringing no oil with it. As a specific example of this action, one particular operation is cited herein.

On the property in question water was being introduced into the oil sand at the rate of from 40 to 50 barrels per day, through each intake well, at a bottom-hole pressure of approximately 1900 pounds per square inch. The adjacent oil wells, at the time of this experiment, were flowing from 15 to 20 barrels of oil per day with no water, with a back pressure on the tubing of from 800 to 900 pounds per square inch. The operator, being desirous of increasing the oil production, decided to build up the bottom-hole input pressure to approximately 2200 pounds per square inch. This was done on a limited number of intake wells to observe the effect therefrom before increasing the pressure throughout the property. The results were disastrous insofar as the production of oil was concerned. The immediate effect was that the water input was almost quadrupled; and in a very few days wells that consistently would flow around 20 barrels of oil per day, with no water, suddenly commenced to flow a solid stream of muddy water and no oil. The muddy water, as will be pointed out later, was most significant; for the water normally produced from the oil wells in water-flooding operations is reasonably free from suspended matter. In order to make sure that the unexpected appearance of the muddy water was not a temporary matter, the increased pressure was maintained for more than a week; but no oil appeared, and there was no apparent diminution in the amount of water produced. The water pressure at the intake wells then was reduced to that which it had been formerly, and the volume of water input declined accordingly. Water production began to drop off immediately at the oil wells, and within a few days oil began to appear in the separating tanks. Within a month's time the wells were back to their former oil production, with only negligible quantities of water coming with it. Further experiments along these lines on this property and on others established the fact that a bottom-hole input pressure of from 2000 to 2100 pounds per square inch could not be exceeded safely. The writer believes that the increased pressure was sufficient to fracture the sand along the bedding planes, and actually arch the beds at the places of separation to the point where practically unobstructed channels were formed through which the water moved with comparative freedom. The muddy water resulted from the washing away of the clay deposited along the bedding planes, which were at this time first exposed to the rapid erosive action of the moving water. An extremely striking feature in the results of this experiment is that it took place in a relatively hard and tight sand that had an average porosity of about 12 percent, and an average permeability of less than 20 millidarcys; and that when the pressure was reduced below the critical point, the indicated up-arched beds collapsed back to their former position, and the intake wells began to take water in a normal manner. This phenomenon corresponds almost identically to the results obtained in many squeeze-cement jobs in that, if for any reason the introduction of fluids is discontinued and at a later time again is commenced, it is necessary to go back to the original break-down pressure in order to introduce any appreciable water into the sand. From this we may conclude that the application of excessive pressures probably will not have a permanently detrimental effect on the producing formations, and that high pressures do provide avenues for the movement of the cement back into the particular formation that it is desired to plug or shut off.

The results of these experiments in the Bradford field may serve as an explanation of the wide variations in break-down pressures which are required in different fields, and even in different wells in the same field. The strength to resist rupture, or if we may call it the rigidity of the rocks themselves, and the weight of the overburden, may be much greater factors in the success of squeeze-cement jobs than the increase in the effective permeability of the sand itself. Unfortunately, it is impossible to make a direct comparison between break-down pressures and effective permeability from actual field experience; but it does appear that, in general, the break-down pressures are lower in the more friable Tertiary sands than they are in the harder and thus stronger Cretaceous sands. This line of reasoning then may be projected further and used as an explanation why squeeze cementing has not been so successful in some of the harder formations of Oklahoma and Kansas. The answer may lie in the fact that sufficiently high disruptive pressures have not been used. It further can be pointed

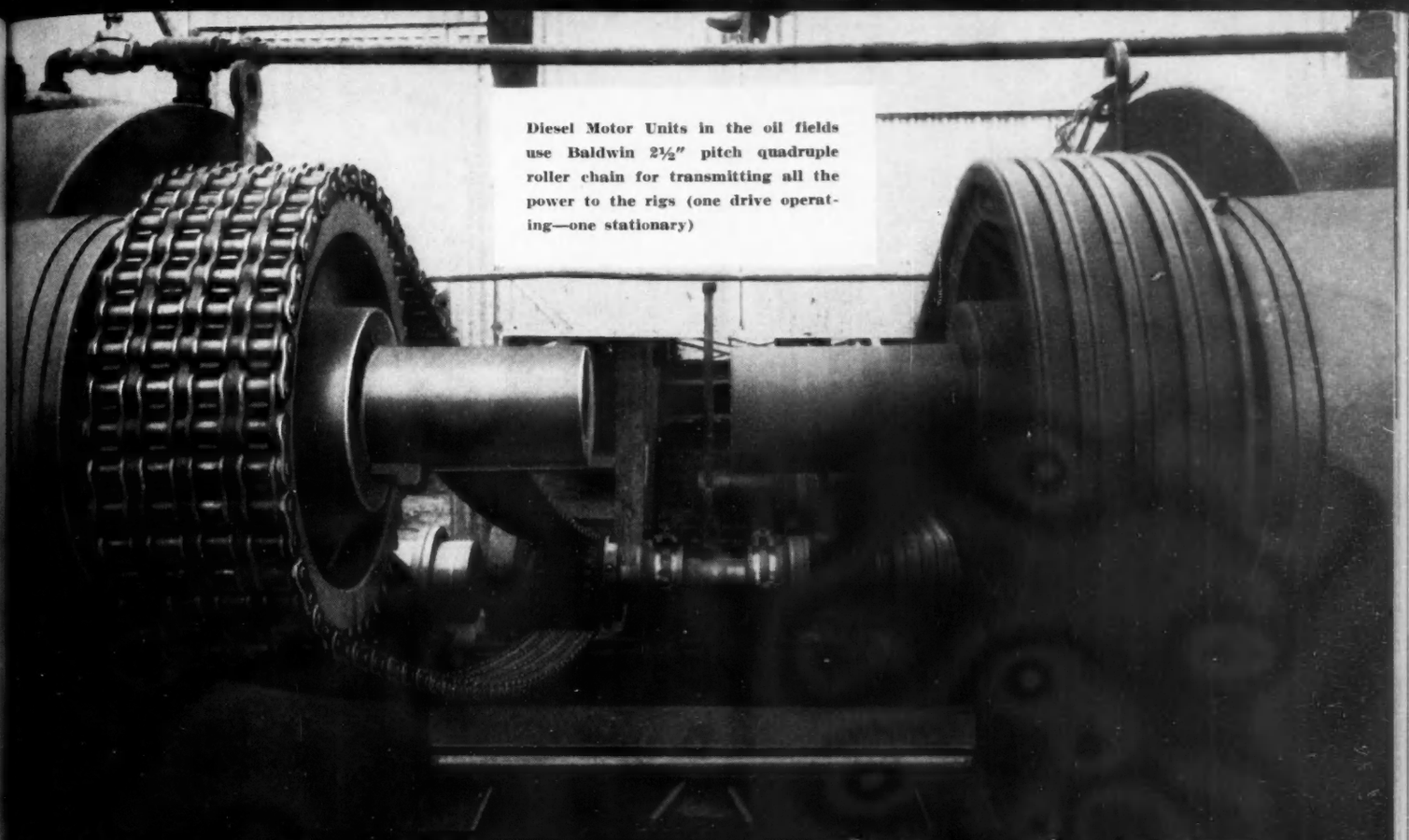

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TABLE 1
Permeabilities and Porosities of Unconsolidated-Sand Samples

SAMPLE No.	Permeability (Darcys)	Porosity (Percent)
1	3,294.2	40.5
2	1,905.0	36.5
3	706.4	36.5
4	250.6	36.0
5	100.0	41.3

out that in the softer and more friable sands, such as we have in the Gulf Coast region, the disruptive fracturing that may take place might not extend back into the formation as far as it would in harder beds whose strength is such that they can uphold better the weight of the overlying rocks. The yield point of the formations, therefore, may have a very direct effect on the break-down pressure; and inasmuch as there have been many squeeze-cement jobs in which an apparently endless amount of cement slurry would go into a sand at a certain pump pressure—even though high pump pressure was required to start pumping water into the sand—we can presume that openings have been formed, and are maintained, that extend back into the sand for a considerable distance. When the pump pressures will build back up to approximately the same point as the break-down pressure while the cement slurry is run, we may presume that the volume of openings is reasonably small; but when the pressures remain at or near the minimum pressure reached after the break-down, it seems reasonable to believe that spaces of considerable magnitude have been formed.

Attention should be called to the probability that, in cases where large quantities of cement may be introduced under a minimum pressure, the break-down pressure previously applied may have been sufficient to shatter the cement formerly placed around the casing. Should the cement bond between the casing and the formations through which it is set be broken, the slurry being pumped in to squeeze off gas or water most likely would be forced up the hole on the outside of the casing, without producing the desired effects in shutting off the gas or water. Under such conditions, batch-cement jobs will be required to re-cement the pipe in the hole before effective squeeze action may be obtained; and it is likely, for this reason, that batch jobs are sometimes successful after other methods have resulted in failure.

The effect of permeability on the break-down pressure and on the degree of cement penetration has been studied extensively in laboratory experiments that have been made by the Halliburton Oil Well Cementing Company, and by Baker Oil Tools, Inc. Some of the results of this work are given herein.

In the Halliburton experiments the permeable materials used were five sifted gravels, or coarse unconsolidated sands. This material was obtained from granite wash, with particles smooth and fairly spherical; and the samples were washed free of fine sand and silt before being used. The permeabilities and porosities of these samples are given in Table 1.

Two types of cement were used: a regular portland, and a slow-setting. Water-cement ratios of 4½ gallons and 6 gallons per sack were used. Each sample was packed 8 inches deep, in a 2-inch hydraulic steel nipple. The nipple then was placed in the testing apparatus, and squeezed against with cement slurry under pump pressure.

The results of the tests, with a slow-setting cement such as is used in many squeeze jobs, are given in Table 2.

An objective was reached in sample No. 4, which had a permeability of 250.6 darcys, where there was no penetration of cement particles at a water-cement ratio of 4½ gallons per sack. There was, however, some penetration of 6 gallons per sack. The final objective was reached in sample No. 5, in which there was no penetration of cement particles in a sample having a permeability of 100 darcys at any water-cement ratio. Somewhere between 100 and 250 darcys is the deadline, according to these tests.

The experiments conducted by Baker Oil Tools, Inc., on cement penetration have given very similar results, although it will be noted in Table 3 that samples of much lower permeability than those tested by Halliburton were used.

The actual permeability of oil sands rarely exceeds 3.5 darcys. From the results of the foregoing experiments, the lowest permeability that gave any penetration was 250 darcys.

Tests have shown that pressure applied to a slurry in a closed vessel has no apparent effect upon the setting rate when the temperature remains constant. However, it has been noted that, at pressures of as high as 3200 pounds per square inch, a cement having an initial set of 1½ hours and a final set of 2½ hours was still quite plastic at 3½ hours. Laboratory tests have shown also that, when the slurry is squeezed against a sand core so that water may be forced out, the slurry will take in 15 minutes a set that approaches final set characteristics.

Differential pressure, or the difference in initial and final pressure on a squeeze job, is important in that it controls the density of the filter cake left on the sand surface. The greater the differential pressure, the more tightly the filter cake is compressed and thickened; consequently, the density of the filter cake is almost directly proportional to the pressure imposed. This relation is shown in Table 4.

The slurry of cement introduced into the well at the surface seems to have some bearing on the density of the filter cake formed on the sand, but apparently not on its permeability.

Experiments show that a thin slurry of 10 gallons of water per sack of cement seems to form a slightly thicker and, consequently, less dense filter cake than formed by a thicker slurry of 4.5 gallons per sack. However, on the addition of still more water to the slurry, the filter cake left on the sand is of about the same thickness and consistency as the one left by the 10-gallon-per-sack slurry. This filter cake may be backed up to some extent by the precipitation of the dissolved silicates and hydroxides from the cement. The use of thin slurries does not seem to be particularly detrimental in the formation of a good filter cake, and the excess water in the thin slurries seems to increase the cementation of the sand behind the filter cake by increasing the solution of the cement particles.

This cementation behind the filter cake is found only when slurries as thin, or thinner, than 10 gallons per sack are used. The cementing material is believed to be calcium hydroxide and certain of the soluble silicate gels. Calcium hydroxide reacts with quartz sand grains at temperatures of 150° F. or higher, forming a calcium silicate. From this evidence we might say that there is a possibility that it might be

TABLE 2

Cement-Slurry Penetration in Unconsolidated-Sand Samples of Different Permeabilities under Varied Pump Pressures

	Water-Cement Ratio (Gallons of Water Per Sack)	Amount of Cement Slurry Squeezed Against Sample (Cubic Inches)	Amount Squeezed through Sample (Cubic Inches)	Penetration of Slurry into Pores of Sample (Inches)	Pump Pressure (Pounds Per Square Inch)			
					To Start Movement of Slurry	5 Minutes	10 Minutes	Final
Sample No. 1 (3,294.2 darcys) with a slow-setting cement	4½	75	50	8	500	1,500	3,500	4,000
	6	75	(all pumped through)					
Sample No. 2 (1,905 darcys) with a slow setting cement	4½	75	10	8	500	3,500	4,000	4,000
	6	75	34	8	500	2,500	3,000	4,000
Sample No. 3 (706.4 darcys) with a slow-setting cement	4½	75	2.3	4	500	3,500	4,000	4,000
	6	75	10.5	5	500	2,500	3,500	4,000
Sample No. 4 (250.6 darcys) with a slow-setting cement	4½	75	18 water	0	500	3,500	3,500	4,000
	6	75	25 water	1	500	3,500	3,500	4,000
Sample No. 5 (100 darcys) with a slow-setting cement	4½	..	37.2 water	0	1,000	4,000	....	....
	6	..	40.6 water	0	1,000	4,000	....	....
	7½	..	52.2 water	0	1,000	4,000	....	....

TABLE 3

Cement-Penetration Tests on Oil Sands and Unconsolidated Compacted Sands of Varied Permeability

SAMPLE	Permeability (Darcys)	Slurry (Gallons Per Sack)	Pressure (Lb. Per Sq. In.)	Results
1	0.192	7.5	2,000	No penetration.
2	1.030	7.5	2,000	No penetration.
3	2.400	7.5	2,000	No penetration.
4	2,400	7.5	2,000	No penetration.
5	3.400	7.5	2,000	No penetration.
6	3.600	7.5	2,000	No penetration.
7	4.100	7.5	2,000	No penetration.
8	55.000	7.5	2,000	No penetration, but some cementation of sand ¼ inch from face.
9	100.000	7.5	2,000	No penetration, but some cementation of sand ½ inch from face.

advisable either to use a cement carrying several percent of calcium hydroxide or to add lime into the mixing water.

The figures given in Table 4 show that there is a very appreciable loss in volume of the slurry due to the loss of water therefrom under pressure. The percentage of loss under the same pressure will depend upon the consistency of the cement, the thick mixtures showing a much smaller loss in volume than the thin mixtures. For example, using 238 cubic inches of slurry at 2000 pounds per square inch pressure, there remained only 165 cubic inches, or a loss of a little less than 31 percent; at 4000 pounds per square inch there remained only 140 cubic inches, or a loss of 41 percent; at 8000 pounds per square inch the loss is about 52 percent.

The question, of course, arises as to why the cement does not shut off the oil-bearing part of the sand, as well as gas and water pays. It has ben indicated previously that the breaking-down effect of the water introduced before the cement is run likely will be excluded from the oil pay, thus providing an easier avenue for the introduction of the slurry into the gas or water pays through such enlarged openings as may be formed. Another possible answer lies in the fact that the cement probably will not set as hard opposite to an oil sand as it will opposite to the water and gas sands. The basis for this conclusion rests on the presumption that very little water will be squeezed out of the cement slurry into the oil sand—the water preferentially going into gas or water sands rather than into an oil sand and, therefore, the cement opposite to the oil sand does not set so rapidly or so hard as it would elsewhere in the hole. In addition to the foregoing, it is a well-known fact that cement clings with difficulty to an object coated with oil, whereas it will adhere readily to a water-coated object.

Taking into account the results of all of these tests, it is still impossible to account entirely for the extra amount of cement used in squeeze-cement jobs, even if the formations that are squeezed had a much higher permeability than that which they are known to possess. The answer apparently lies in the increased spaces provided by disintegration and erosion of the sand; by the effect of the high pressures in separating individual beds or segments of the sand, thereby creating additional space for the compaction of the cement; and, of course, as has been pointed out previously, by the loss of slurry up the hole behind the pipe owing to a poor cementing job on the casing.

End of Part 1, Part 2 will appear in an early issue.

TABLE 4

Relation of Varied Pressures to Final Volume of Slurry in Penetration Tests on a Sand of 3.5 Darcys Permeability

TEST No.	Slurry (Gallons Per Sack)	Pressure (Lb. Sq. In.)	Original Volume of Slurry (Cubic Inches)	Final Volume of Slurry (Cubic Inches)
1	4.5	2,000	238	165
2	4.5	4,000	238	140
3	4.5	6,000	238	130
4	4.5	8,000	238	115
5	10.0	2,000	366	180
6	10.0	4,000	366	155
7	10.0	6,000	366	130
8	10.0	8,000	366	Lost
9	20.0	2,000	636	180
10	20.0	4,000	636	155
11	20.0	6,000	636	140
12	20.0	8,000	636	Lost

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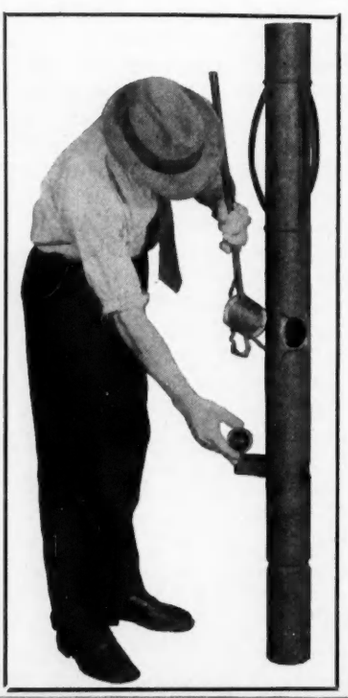

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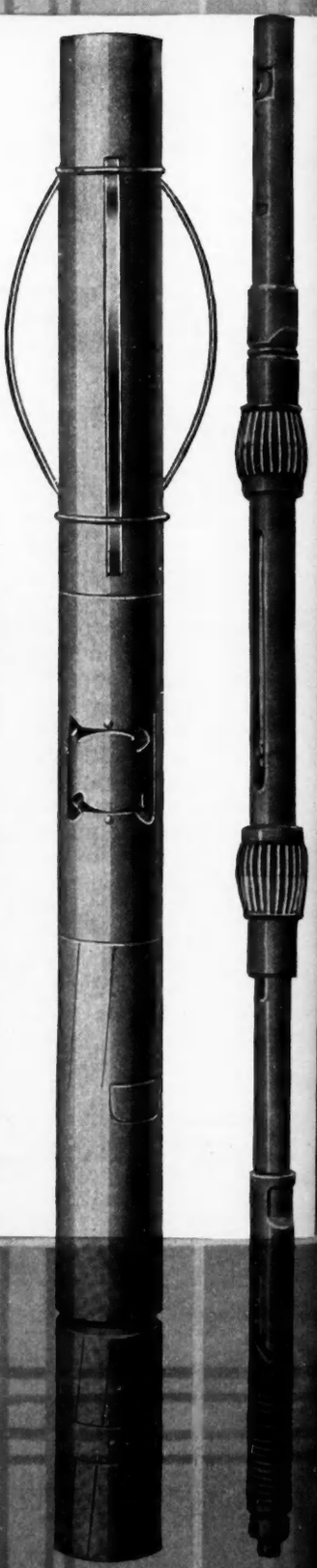

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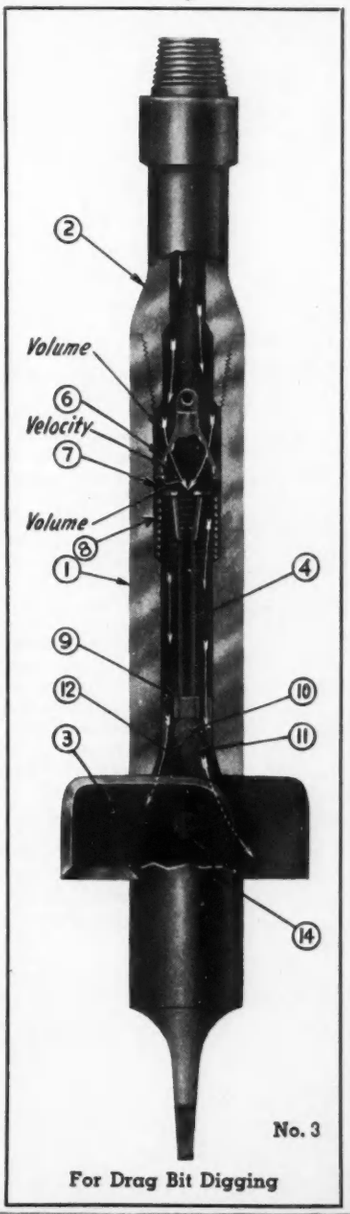

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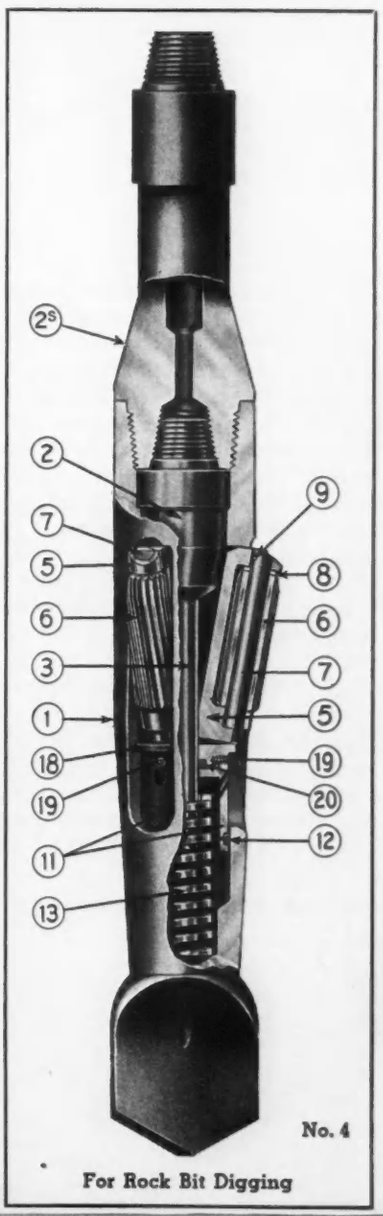

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Temperature Determination in the Cooling Beads of Arc Welds in Steel Casing

By W. A. BRUCE
The Carter Oil Company, Tulsa, Oklahoma

THE mathematical formula which describes the cooling of a circumferential casing weld is compared with temperature measurements made on about 50 field-type casing welds. This comparison indicates that the formula may be used freely to determine the temperatures and the time rate of change of temperatures in or near cooling welds. The numerical evaluation of this formula is described, and the use of approximate formulas is indicated. Curves are given showing the trends of the cooling of the casing when variables of welding, such as number of welders, arc current, pounds of metal per inch of weld, and percent of the total time spent welding the last bead, are calculated.

The experimental data indicate that the use of the formula well may be more accurate for determining temperatures than any set of tests in which these temperatures were measured. It is shown that a deviation from the mean temperature at any time for any particular temperature measurement is most probably 5.7 percent.

This paper was presented at Ninth Mid-Year Meeting, American Petroleum Institute, at the Roosevelt Hotel, New Orleans, Louisiana, May 18, 1939. (The statements and opinions expressed herein are those of the author, and should not be construed as an official action or opinion of the Institute nor of this publication.)

ENGINEERS who are interested in circumferential casing welding have known for some time that the exact knowledge of the temperature distribution and of the cooling rates is necessary for a metallurgical understanding of this type of weld. At first it appears that the most direct method of getting this thermal information is to weld some pipe and to measure the temperatures. This presents two difficulties, as follows: 1. There is an infinite number of sets of conditions in field welds. 2. For each set of conditions the variations of the behavior of an individual welder, his machine, and the thickness of the casing are such that a number of similar tests would have to be made to obtain the average behavior of a weld made for a given set of conditions. The alternative is to use the heat theory to develop an equation which would express the temperature at any place in the casing at any time. In this work such a general equation for the flow of heat was developed. This equation was given a thorough test for its ability to predict the temperatures in a number of common field-type welds. The equation then was used to give the temperature for cases other than those tested.

Use of the Heat Theory

The development of an equation describing the cooling of a circumferential weld has been given previously.[1] The following is a very brief outline of this development. We start with the fundamental-heat equation,[2, 3] which is:

$$k\nabla^2\theta = \frac{\partial\theta}{\partial t} + \lambda\theta \qquad (1)$$

Where:

k = diffusivity.
θ = temperature.
λ = a radiation constant.

It can be shown that the temperature produced by a number of welders completing a weld on thin casing is given by:

$$\theta = \sum_{n=-\infty}^{n=+\infty} \frac{q}{4\pi Kbv} \int_{nw}^{(n+1)w} \frac{1}{\left(\frac{x'}{v+T}\right)} \cdot e^{-\lambda\left(\frac{x'}{v+T}\right)} \cdot e^{-\frac{(x-x'-nw)^2+y^2}{4k\left(\frac{x'}{v+T}\right)}} \cdot dx' \qquad (2)$$

Where:

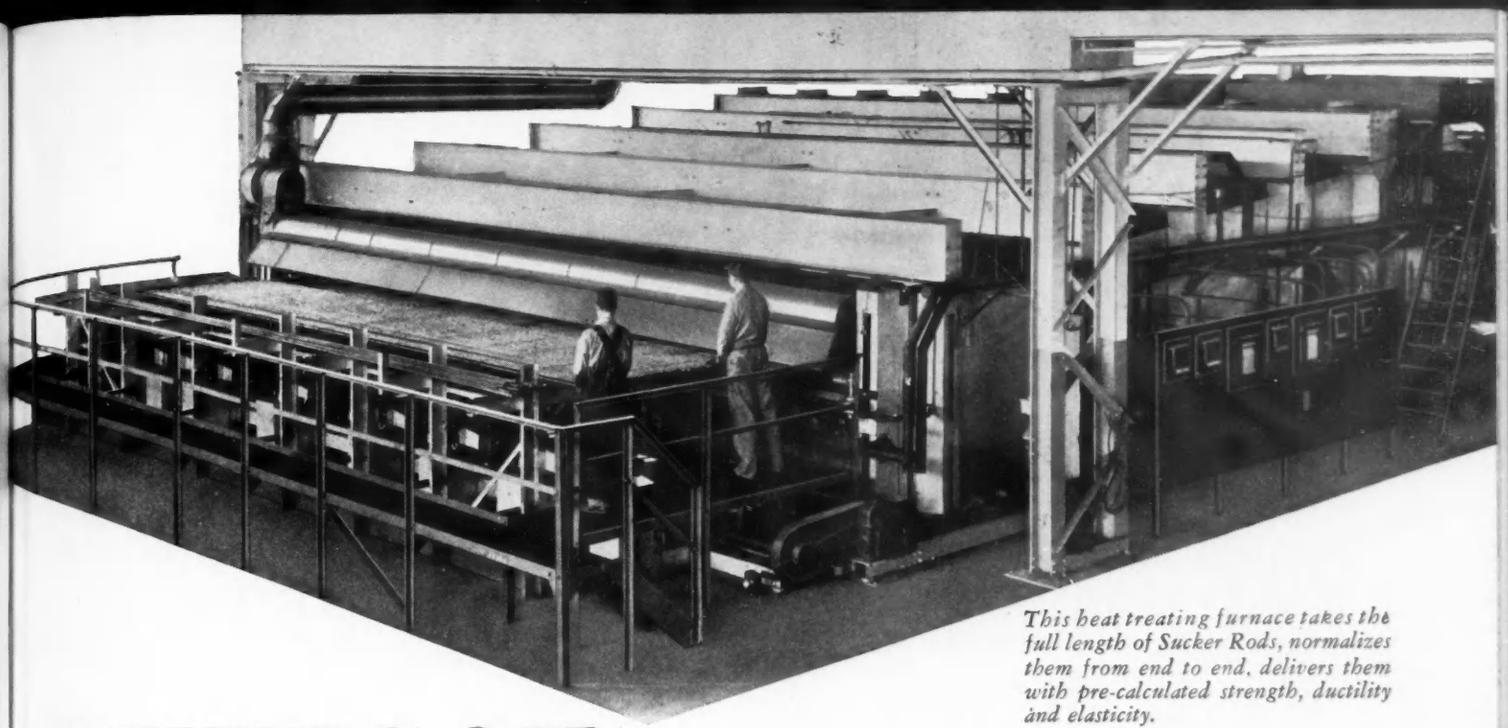
w = separation of the welders.
v = velocity.
T = time after welders break arc.

$$q' = \frac{q}{4\pi Kb}$$

q = calories per second.
K = conductivity.
b = wall thickness of the casing.
x = circumferential coordinate.
y = vertical coordinate.

$$\xi_n = \frac{v}{2k}(x + vT - nw)$$

(Zero of the coordinate system is the point where any welder finishes.) A good approximation of the integral in equation (2) may be given in terms of Bessel functions of the second kind. For values of $\xi_0 < \frac{vw}{k}$ the approximation is good to 2 percent. The approximate solution is:



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$$\theta = q' e^{-\lambda\tau} [e^{\xi_0} K_0(\xi_0) + e^{\xi_{-1}} K_0(\xi_{-1})] \quad (3)$$

When $\xi_0 > \frac{vw}{k}$, the summation (2), approaches:

$$\theta = \frac{q' \cdot e^{-\lambda\tau}}{v} \frac{\sqrt{4\pi k}}{\sqrt{T}} \quad (4)$$

The rate of cooling curves may be obtained by differentiating (2) or (3).

$$\frac{\partial\theta}{\partial t} = q' \left(e^{\xi_0} [K_1(\xi_0) - K_0(\xi_0)] + e^{\xi_{-1}} [K_1(\xi_{-1}) - K_0(\xi_{-1})] \right) \cdot \frac{\partial\xi}{\partial t} * \quad (5)$$

K_0 and K_1 are Bessel functions of the second kind, first and second order, respectively.[4] From the general principle of superposition, one is able to compute separately the effect of each bead and to add these effects algebraically. Proper allowance for difference in time between beads must be made.

In plotting the curves of temperature vs. time there are four fundamental parameters, w, v, b, and q. For the consideration of most field welds it is possible to show that these parameters have certain functional relationships, and these functional relationships can be found in the literature of welding technique.[6, 7]

Temperature Recording

The system for recording the temperature of the cooling weld consisted of thermocouples, a rotary switch for changing from one thermocouple to another, and a galvanometer with a reflected-light beam focused on moving photographic paper. The galvanometer was connected in series with the thermocouple system and the switch. The thermocouple wire was chromel-alumel (size No. 14, B and S gage). This wire was chosen for several reasons: 1. It is similar to steel in thermal characteristics; and, consequently, when the wire was embedded in the weld, it would be least likely to cause a discontinuity in the isothermal lines. 2. Chromel-alumel has a very high electromotive power. 3. Its e.m.f.† is practically linear with the temperature in the range 32 to 2500° F.

It was known that many experimenters[5] had observed a lag in thermocouple e.m.f. where the temperatures were changing rapidly. In the diagram in Figure 1, **A** indicates the cause of the lag, and **B** shows how it may be reduced. In the type of thermocouple in Figure 1, **A**, the two wires are fused together in such a way that the interface between the two metals is shielded by a considerable fraction of the diameter of the wire. Thus, the heat has to be conducted to the center of the wire before the correct temperature reading can be made. Figure 1, **B**, shows a connection in which the molten metal is an element of the thermocouple system. The temperatures of the surfaces between the wire and the metal all contribute to the thermoelectric e.m.f., and the e.m.f. reduction here is only that due to the reduction in the temperature of the molten metal as a result of the cooling action of the thermocouple wires.

Experiments were performed with molten zinc (786° F.) and with molten aluminum (1216° F.). About 200 grams of zinc was melted and allowed to cool until crystallization started. The thermocouple wires, held about ⅛ inch apart, were pushed into the zinc to a depth of ¼ inch. At the end of 0.1 second the record showed the temperature to be 708° F., or 10 percent below the melting point of zinc; and at the end of 0.6 second the reading was 778° F., or 1 percent below the melting point of zinc. This experiment was repeated with molten aluminum, and the results were practically the same. A temperature 1½ percent below the melting point was observed at 0.5 second after the thermocouple had been introduced into the freezing metal. These tests indicated that the connection (Figure 1, **B**) was satisfactory for the temperature measurements of cooling welds when the wires were to be welded into the final bead.

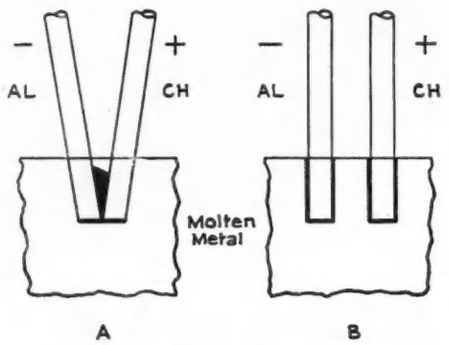

FIGURE 1
Thermocouple Connections

One precaution must be observed in the use of the type of connection shown in Figure 1, **B**. The temperature of both leads must be the same where they are in contact with the third material. In these experiments the temperatures of the two wires were practically equal after approximately 1 second.

A Recording Galvanometer

In order to record the rapidly-changing thermocouple e.m.f., a taut suspension oil-immersed galvanometer was made. The stationary magnetic field was provided by a strong permanent magnet. The coil was made by winding 300 turns of No. 44, B and S gage enameled copper wire about a 1-mm. x 5-mm. frame. This coil, whose resistance was 101 ohms, was suspended between the poles of the magnet by means of a 0.00125-mm. x 0.0125-mm. silver-ribbon suspension.

A 0.2-mm. x 5-mm. mirror was mounted on the front of the coil, and the whole assembly was placed in a water-tight case. The case was filled with a mineral oil, and the completed instrument was found to have a sensitivity of about 1 microampere per millimeter of deflection. Inasmuch as the chromel-alumel thermocouple produced about 60 millivolts at the melting point of steel, this galvanometer with an external resistance of 150 ohms used 6 inches of the recording paper to record the melting point of steel. The record paper, which was used in a conventional seismograph-type "light-tight box," was standard 6½-inch sensitive Eastman paper. It was marked by a light beam reflected from the galvanometer and timed with the aid of a standard electric clock. It could be moved at various speeds from 3 feet to 10 feet per minute.

Calorimetric Tests

It was necessary to perform calorimetric tests to determine the total amount of heat per second being transferred from the arc to the steel casing, and to compare this with the amount of heat per second developed by the arc. (In calories per second this is the product of the voltage by the current divided by 4.187.) For these tests the casing was beveled and cut in 6-inch sections. The bead was made by letting three welders

* It is assumed that λ is very small.
† E.m.f. = electromotive force.

TABLE 1

Values of Experimental Data Averaged and Recorded by Groups

Group	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Individual test No.	2, 3	5, 7	6, 8, 9	11, 12, 13, 14	15, 16, 17, 18	19	20, 21, 22	27	29, 30	31, 32	33	61, 62	72, 73, 74	75, 76, 77	80
Outside diameter, in.	8⅝	7	7	7	7	7	7	7	7	7	7	10¾	5½ Bell and Spigot	5½ Bell and Spigot	5½
Wall thickness, in.	0.372	0.372	0.339	0.310	0.290	0.407	0.421	0.292	0.309	0.339	0.374	0.415	....	....	0.231
Number of welders	3	3	3	3	3	3	2	3	3	3	3	3	2	2	2
Number of beads	3	3	3	3	3	3	3	2	2	2	2	4	2	2	2
Rod size, in.	5/32	5/32	5/32	5/32	5/32	¼	5/32	5/32	5/32	5/32	5/32	5/32	5/32	5/32	5/32
Ammeter reading	153	140	151	156	153	210	160	140	154	154	162	225	219	228	180
Time of first bead, sec.	69	62	72	73	51	185	102	64	74	81	85	67	35	37	36
Time of first interval, sec.	66	75	65	41	35	53	30	95	53	80	37	44	45	35	34
Time of second bead, sec.	132	97	96	87	72	113	165	62	79	84	86	95	43	47	50
Time of second interval, sec.	120	95	70	81	93	...	52	...	...	...	...	48	...	...	...
Time of third bead, sec.	106	69	57	53	51	...	128	...	...	...	...	92	0.232*	0.280*	...
Time of third interval, sec.	...	...	...	...	...	...	...	...	...	...	...	38	0.261†	0.322†	...
Time of fourth bead, sec.	...	...	...	...	...	...	...	...	...	...	...	91	...	...	...
Time (Seconds)															
Temperature (in Deg. F.) Vs. Time After Welders Break Arc — 2	2,700	1,970	2,310	2,620	2,600	2,700	2,700	...	2,700	2,400	2,400	2,500	2,700	2,700	2,700
5	1,840	1,610	1,860	2,170	2,030	2,300	1,970	...	2,180	1,870	1,910	1,790	1,820	1,820	2,300
10	1,430	1,280	1,510	1,680	1,560	1,810	1,440	1,730	1,780	1,460	1,500	1,390	1,390	1,340	1,840
20	1,160	1,120	1,240	1,310	1,270	1,440	1,170	1,310	1,320	1,200	1,230	1,180	1,150	1,070	1,370
30	1,040	1,020	1,130	1,180	1,150	1,300	1,070	1,150	1,170	1,080	1,110	1,080	980	910	1,220
60	840	830	910	980	930	1,050	870	880	920	870	880	880	720	660	890
90	710	710	810	840	780	870	760	750	770	770	730	780	610	580	720
120	640	660	710	720	690	760	680	660	670	670	660	690	550	520	600
150	590	590	640	650	630	730	630	590	590	...	...	640	500	480	550
180	550	540	590	590	580	...	590	540	530	...	...	600	480	450	490
210	520	510	550	...	...	...	570	...	500	...	...	...	440	440	460
240	490	480	510	...	...	...	500	...	...	...	...	...	420	410	420
300	...	440	...	...	...	...	...	...	...	...	...	...	390	390	380

* Bell thickness.
† Spigot thickness.

work at normal speed. The welded casing was lowered quickly into the fluid of the calorimeter, which in this case was glycerin. Readings of the welding time and current were made during welding, and a record of the increase in temperature of the glycerin and steel was taken. From this and the specific heat of glycerin and steel, the actual calories imparted to the casing could be determined. The error of this experiment was 2 or 3 percent.

Welding and Recording Procedure

Most tests were made with three welders working simultaneously, and their procedure was as follows: The casing was beveled by torch or machine, and allowed to cool. Each welder took his position even with a mark, and at a signal all three welders started welding from left to right, using reverse polarity. The welders maintained a nearly-uniform welding speed, and were able to finish a bead at approximately the same time. The welders stepped back, and a helper knocked off the scale and brushed the weld clean. The second bead was put on in the same way as the first, etc. At the start of the last bead the welders took up their thermocouples, and carried them as they worked. When they came to the end of the bead, each one welded his thermocouple wires into the steel casing.

While the welders were operating their arcs, a record was made of the actual time the arc was maintained, and a reading of the arc current was recorded every 5 seconds. These readings were recorded by the same operator each time, and later averaged and compared with similar readings made in connection with the calorimetric tests. The interval between beads also was recorded. The record paper counted the time after the thermocouples had been welded in place.

Tabulation of Experimental Results

Table 1 contains the average values of all the experimental data pertaining to the typical field-type completed weld. The values listed under each group represent averages of all the experimental values obtained in each test. For example, in group "D" we have the joint tests whose test numbers are 11, 12, 13, and 14. For outside diameter, all casing was near enough to its rated value to use that value. The wall thickness of each joint was measured before a test at the edge of the joint. The measurements were taken in four places on each half of the joint. Inasmuch as all of the four joints were similar, these readings, which were taken for tests 11, 12, 13, and 14, were averaged to give the value 0.310 inch shown for group "D" opposite "wall thickness." The ammeter readings were observed in individual tests as described previously, and averaged by groups. The times of welding averaged for all the tests in a group are recorded as "time of first bead," etc., and likewise for the intervals between beads.

In these tests 0.25- to 0.35-percent carbon steels and Lincoln-shield arc electrodes, No. 5 and 85, were used. As far as thermal tests are concerned, these data have little bearing other than to know that the steels were thermally very similar.

The tests listed in Table 1 are of plain-end V-bevel joints with the exception of groups "M" and "N," which are bell-and-spigot joints.

Experimental Error and Factor of Safety

In Table 1 the average temperatures of the groups of experiments have been presented. The values used had a noticeable dispersion among the experimental values of the temperatures in a group.

It is necessary to consider this dispersion or error in two ways: 1, the effect of the error upon the validity of a single experiment or of a group; and 2, the calculation of a factor of safety to be used to account for the deviation of a field-weld temperature from the averaged curves.

The dispersion in these experiments is largely due to three causes: 1, the experimental error of the measuring apparatus; 2, the varying degrees of eccentricity in the specimen; and, 3, the variation in application of heat to the weld by the welder. Of these, the third is much greater than the second, and the second is much greater than the first. To speak of a percent error (100 times the difference between a temperature reading and its

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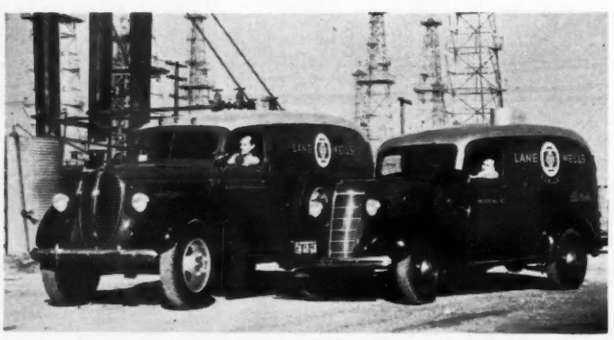

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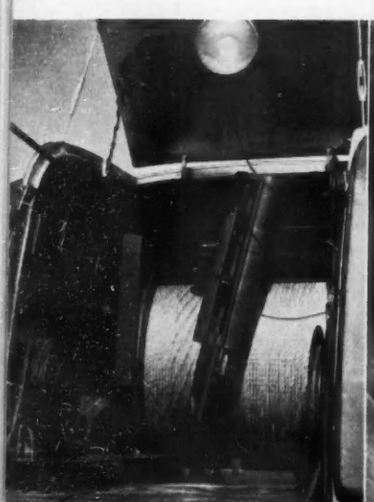

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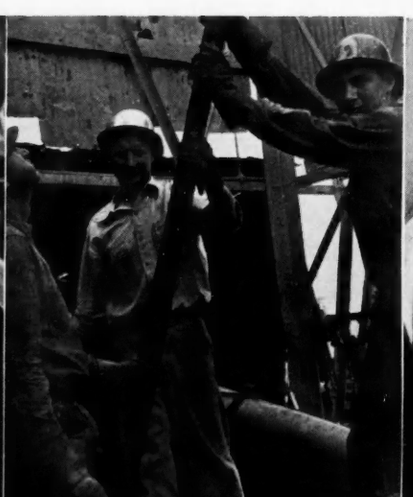

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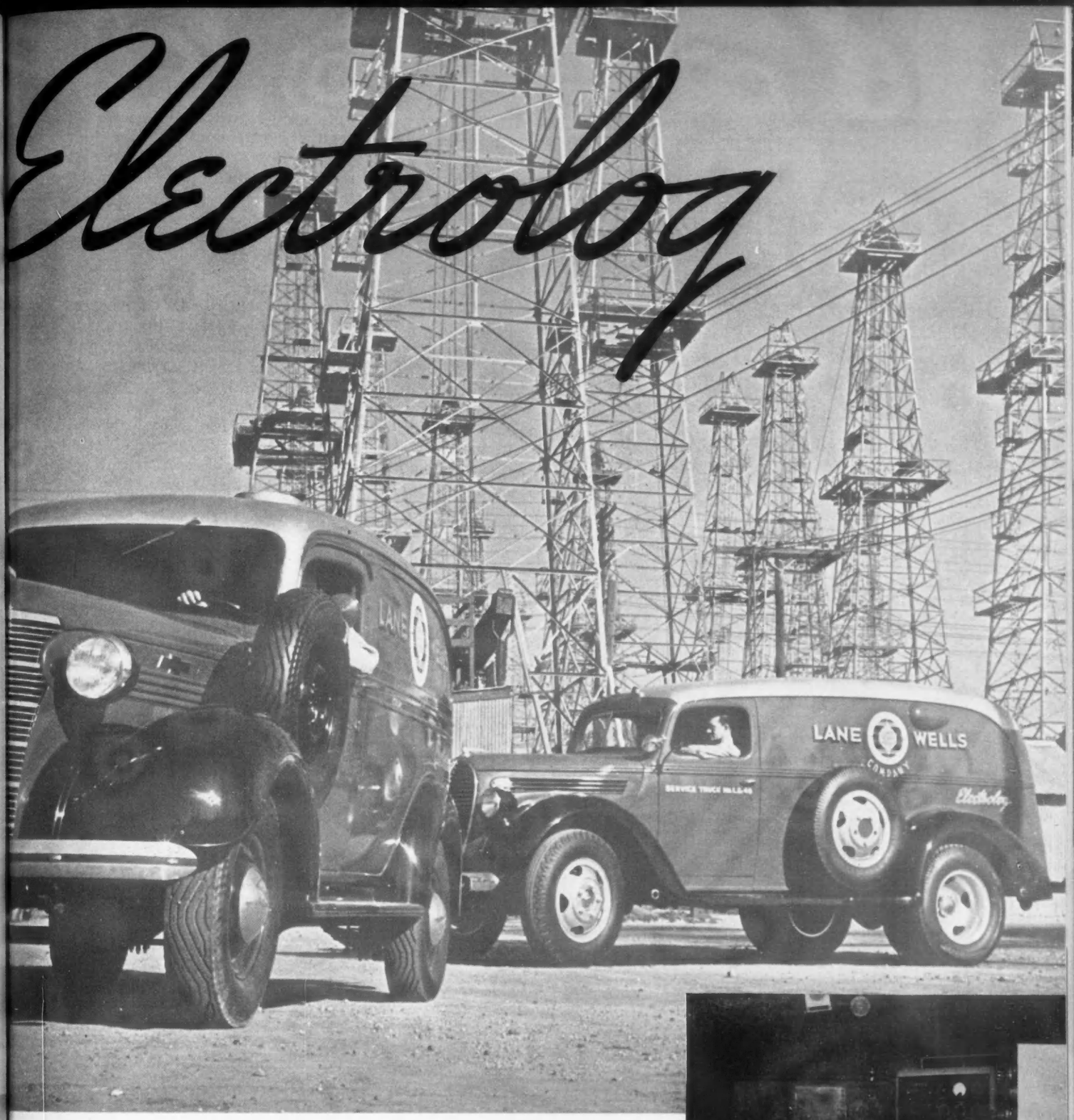

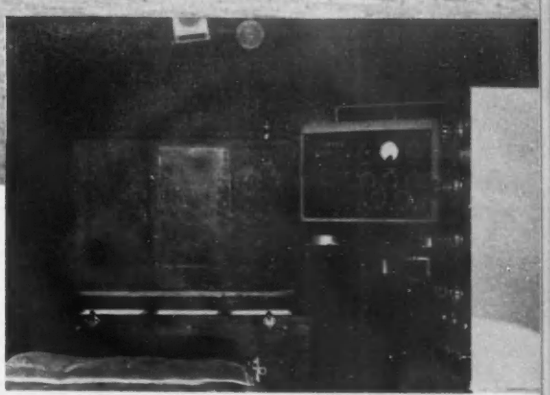

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corresponding mean divided by the mean) allows the use of 50 or so readings in the determination of the standard deviation, σ.

$$\sigma = \sqrt{\frac{\Sigma \text{ percent error}}{n}} \qquad (6)$$

The values of σ determined for 7-inch casing from experiments in groups "D" and "E" are as follows:

T (Deg. F.)	σ (Deg. F.)	$\frac{100\sigma}{T}$
2,100	284	13.0
1,620	157	9.7
1,290	77	6.0
1,160	65	5.6
960	69	7.2
810	61	7.5
710	49	6.9
640	43	6.7

Average $\sigma = 7.8$ percent.

This leads to a probable error of 5.7 percent (57° F. at 1000 sec.). Thus, if a certainty of 10,000 to 1 is desired, a factor of safety of 1.33 on the temperature axis should be used.

Theoretical and Experimental Comparison

Table 1 contains most of the experimental data necessary for the calculation of a theoretical-temperature-vs.-time curve, taken at the point where the welders stop. In the use of equation (2) or (3) the additional information needed is:

$K = 0.100$
$\lambda = 0.002$
$k = 0.113$

(Centigram units were used in calculation, and the degrees centigrade converted to degrees Fahrenheit at the end.) In all places where the actual calories per second are not given, q may be obtained from the relationship:

$$q = 0.75 \frac{\text{current times voltage}}{4.187} \qquad (7)$$

The factor 0.75 was determined by several of the calorimetric tests heretofore described. This represents the proportion of heat developed at the arc that was transferred to the casing. The values of k, K, and λ all vary with the temperature, and it was necessary to choose an average value of these. The average temperature for which all of these values were chosen was 750° F. The specific heat values were furnished us by the U. S. Bureau of Standards; the conductivities were obtained from the Bethlehem Steel Corporation. The value of λ was taken from a paper by Jensen.[8]

The theoretical curves obtained by using equation (2) are shown in Figures 2 to 14, inclusive, covering groups "A" to "E," inclusive, and "G" to "N," inclusive. The experimental points taken from Table 1 are indicated by the circles. The deviation of experimental values from the theoretical curve in any group is well within the reasonable experimental error indicated by our probable error.

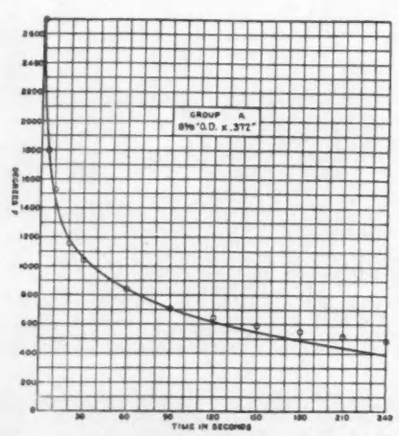

FIGURE 2
Cooling Curve for Group "A."

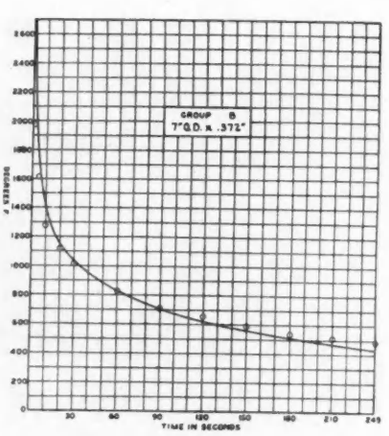

FIGURE 3
Cooling Curve for Group "B."

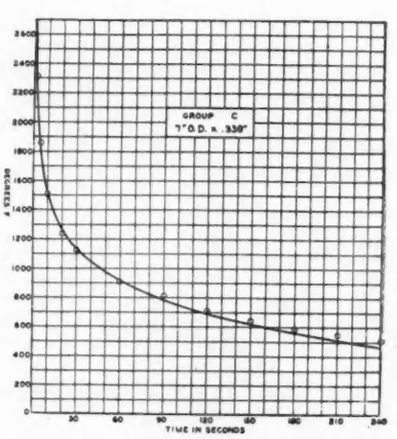

FIGURE 4
Cooling Curve for Group "C."

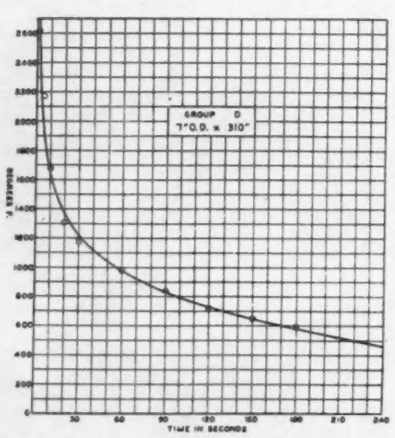

FIGURE 5
Cooling Curve for Group "D."

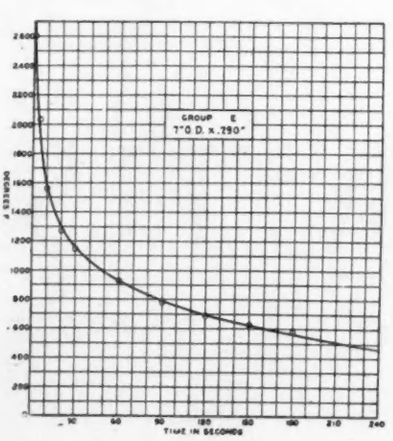

FIGURE 6
Cooling Curve for Group "E."

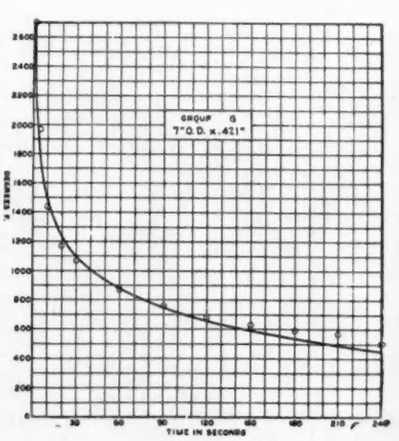

FIGURE 7
Cooling Curve for Group "G."

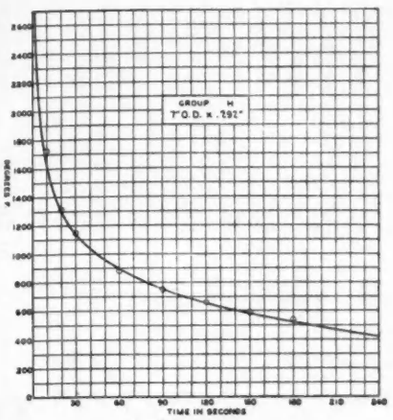

FIGURE 8
Cooling Curve for Group "H."

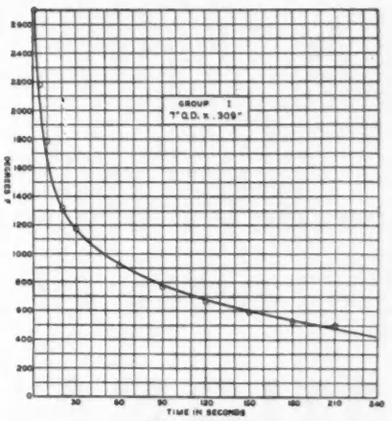

FIGURE 9
Cooling Curve for Group "I."

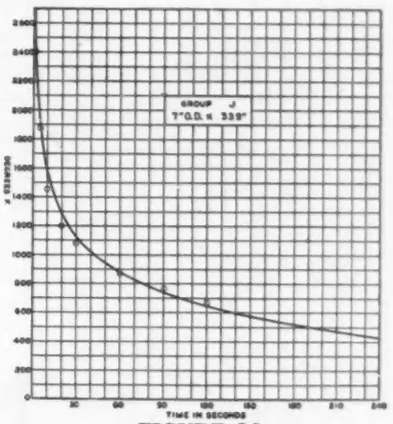

FIGURE 10
Cooling Curve for Group "J."

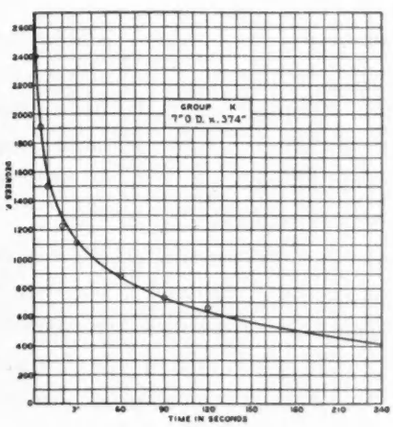

FIGURE 11
Cooling Curve for Group "K."

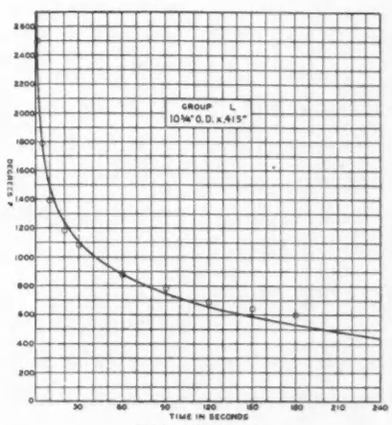

FIGURE 12
Cooling Curve for Group "L."

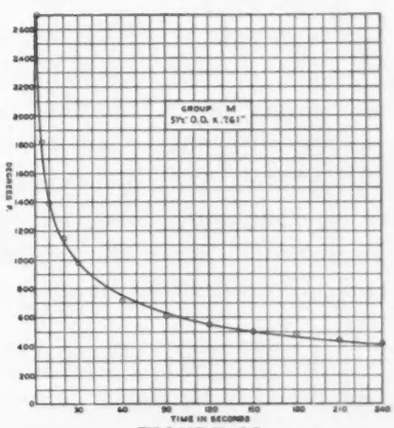

FIGURE 13
Cooling Curve for Group "M."

Temperature-Vs.-Time and Rate-of-Cooling Curves

The next phase of this problem was to apply equation (2) or (3) to the calculation of the temperatures in the cooling beads of various types of casing welds. It was mentioned previously that the fundamental parameters are w, v, b, and q. For any new condition b is given, q may be obtained from the current and voltage, and w is obtained by dividing the mean diameter of the casing by the number of welders. This leaves v as our only troublesome parameter. The speed of welding, v, depends upon the nature of the weld, the thickness of the casing, the electrode, the current, the penetration, and possibly other variables. Thus, it is practically impossible to get at the speed of welding from an entirely theoretical standpoint. Jensen has made an attempt to do this. He assumed a definite burn-off rate for a given current and a volume of metal per inch of weld according to the geometry of the groove. The theoretical curve obtained in this way gave a higher speed than he observed experimentally, and a similar result was obtained in the experiments indicated in our Table 1. The actual speed of welding obtained by combining our experimental data with that of Jensen[8] is shown in Figure 15. For the plain-end V-bevel welding with 3/16-inch electrode and 150 amperes, a burn-off rate of 0.073 pounds per minute (including coating) was taken.[7a] In the narrow range near 150 amperes this burn-off rate was assumed to be proportional to the current. The actual speed of welding is the product of the rate of consumption of the electrode, in pounds per minute, times the lineal inches of weld made per pound of electrode. The speed curve, Figure 15, obtained in this way agrees well with the one given in a welding handbook.[7b] The speed curve for the bell-and-spigot weld also is shown in Figure 15. This is obtained by multiplying the burn-off rate at 200 amperes (0.085 pounds per minute) times the lineal inches of weld per pound of electrode. The lineal inches per pound of electrode is obtained from tables.[7c] The method of obtaining lineal inches per pound of electrode to use as a parameter in our equation is optional; but there is a certain amount of justification for this choice, because we know that any other information concern-

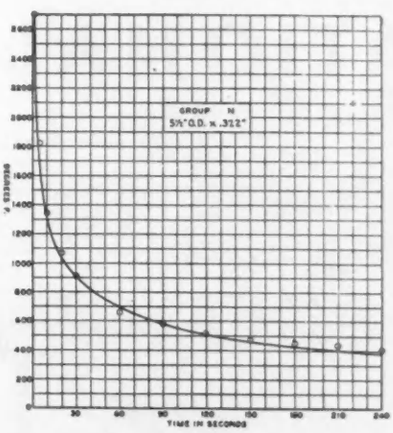

FIGURE 14
Cooling Curve for Group "N."

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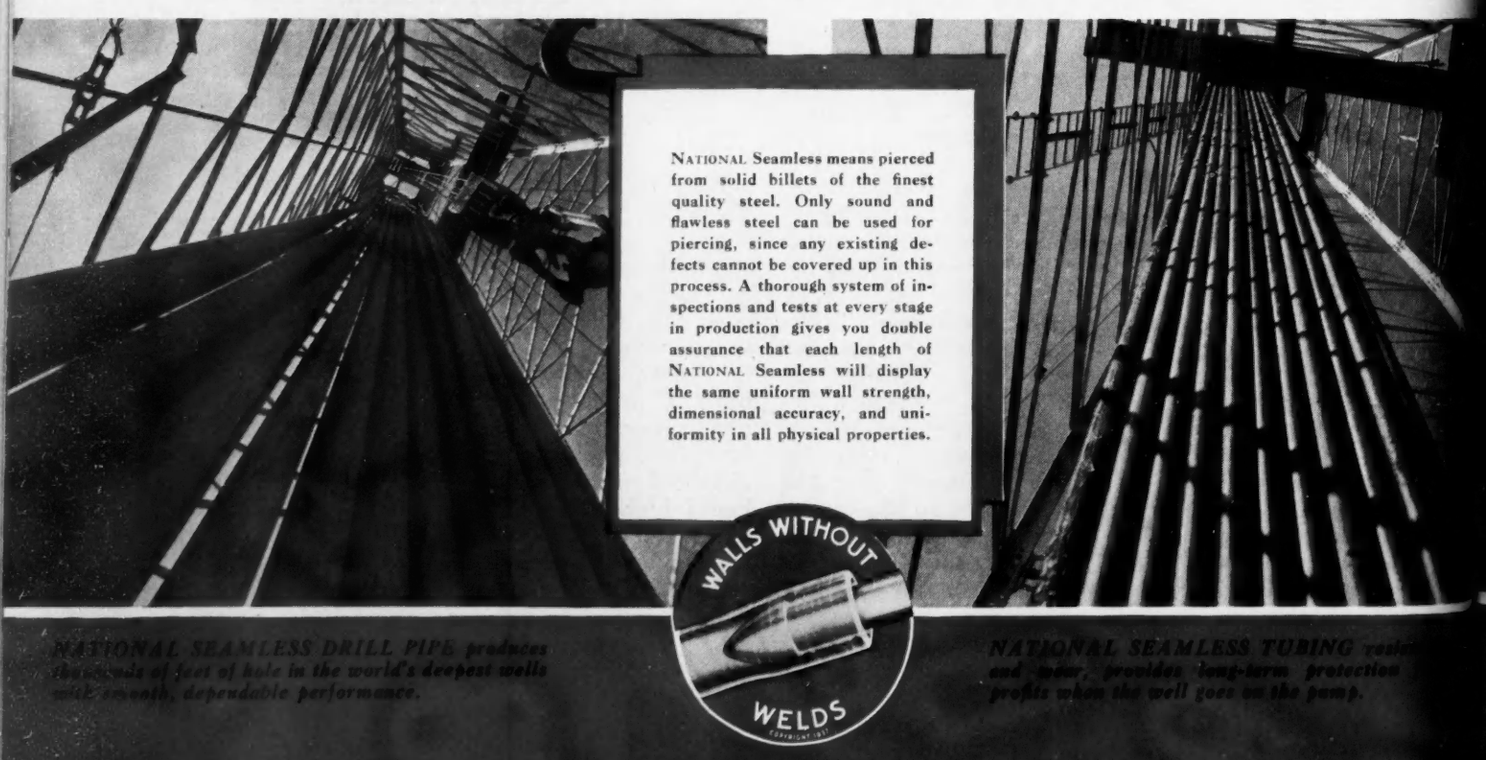
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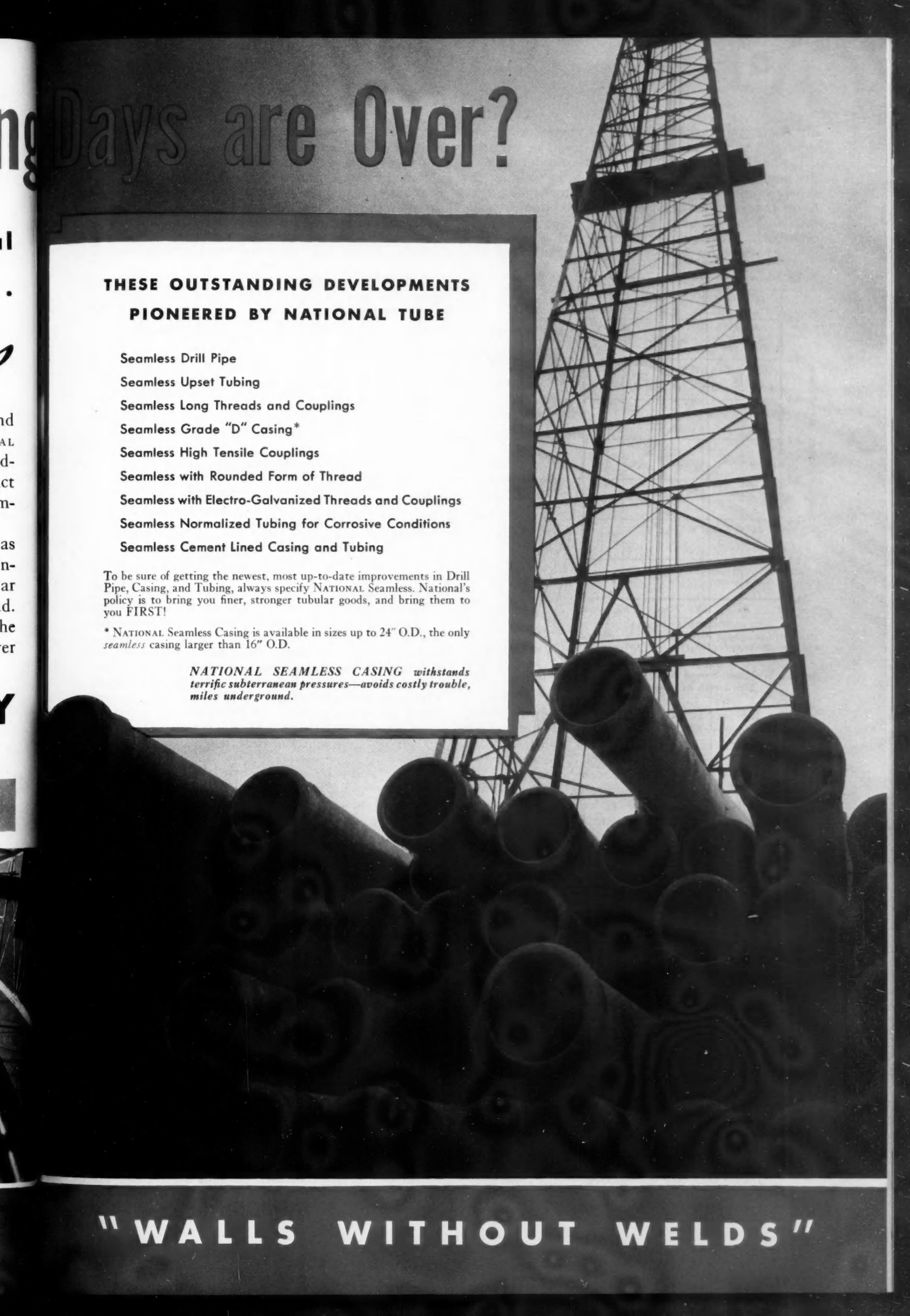
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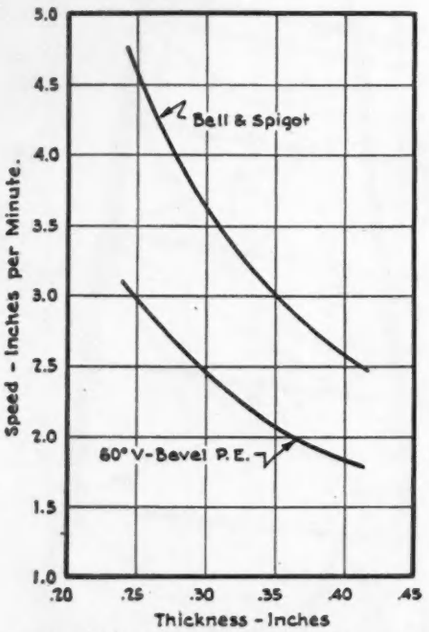
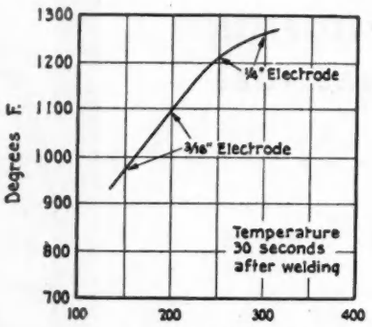
"WALLS WITHOUT WELDS"

ing the amount of metal used to complete a given weld will show the same general trend in variation with the thickness of casing under consideration. In the use of two, three, or four beads in welding the velocities given in Figure 15 will be multiplied by 2, 3, or 4, respectively. Here the assumption is made that an equal amount of time is taken in welding each bead. This is not true in general. For instance in three beads the tendency is to spend a longer time



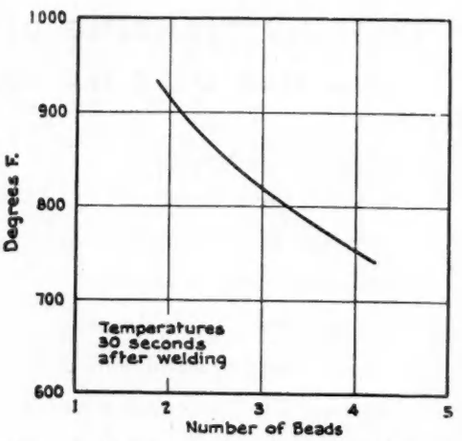
The bell-and-spigot curve is for 200 amperes, and the plain-end (P.E.) is for 150 amperes.

FIGURE 15
Actual Welding Speed as a Function of Thickness of Casing



5½-in.-outside-diameter 0.330-in. bell-and-spigot joint; 2 welders; 2 beads; 45-sec. interval between beads.

FIGURE 16
Variation with Current



5½-in.-outside-diameter 0.400-in. bell-and-spigot joint; 2 welders; 45-sec. interval between beads.

FIGURE 17
Variation in Number of Beads.

welding the second bead. However, it will be shown how the corrections can be made for a non-uniform distribution of time in welding of multiple beads. For bell-and-spigot welding, the voltage and current relationships given in Table 2 were assumed.

In case of V-bevel plain-end casing it was assumed that 25 volts were used for all currents. Figure 16 shows the variation of the temperatures with the current. These temperatures are calculated for a time of 30 seconds after the welders break arc. Figure 17 shows the variations with the number of beads used. Figure 18 shows a variation with the percent of time spent welding the last bead.

Figure 19 shows variation with the number of welders. Figure 20 shows the variation with the amount of metal used per lineal inch of weld. Figure 20 is shown for the bell-and-spigot casing, because in this type of casing there is the largest variation in field practice in the size of the bead. Some welders use as much as twice the metal that others use. This variation in pounds of metal per inch has a most pronounced effect on the cooling of welded casing.

To determine the temperature of a cooling bead at any time it is necessary to use the exact equation (2).

TABLE 2
Voltage and Current Relationships

Rod Size (Inches)	Amperes	Volts	Calories Per Second
3/16	150	26-28	750
3/16	200	28-30	1,070
1/4	250	30-32	1,430
1/4	300	30-32	1,720

In order to use equation (2), we shall obtain numerical values for the various parameters in the following way: The speed of welding in a given bead is obtained by looking at Figure 15, opposite the thickness of our casing, and multiplying the reading found there by the number of beads to be made. To obtain w divide the mean circumference by the number of welders. The value of q has been described previously. When more than one bead is to be considered, it is necessary to determine the interval between the end of each bead and the zero of our time system, i. e., the end of the final bead. For instance, the interval for the next to the last bead will be the duration of the final bead plus the time consumed in removing scale, and similarly for the other beads. The total temperature at any time after the welders break arc is the sum of the calculated temperatures produced by each bead with the proper adjustment for the difference in the time when each bead was deposited.

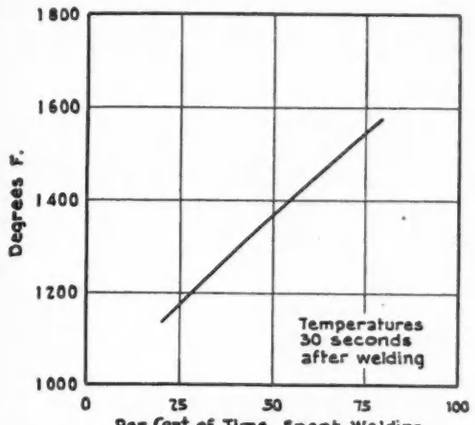
It was pointed out previously that equations (3) and (4) would give approximations which were better than 2 percent. Equation (3) was to be used for values of

$\xi_0 < \frac{vw}{k}$, and equation (4) for values of $\xi_0 > \frac{vw}{k}$.

The procedure in making the approximate calculation is: Determine the values of ξ_0 and ξ_{-1} for various values of time and obtain the value of $e^{\xi} K_0(\xi)$ from the Bessel function tables.[4] When $\xi > 20$, it is necessary to evaluate the Bessel function, because the argument of this function is not tabulated beyond $\xi = 20$. The formula:

$$e^{\xi} K_0(\xi) = \sqrt{\frac{\pi}{2\xi}} \qquad (8)$$

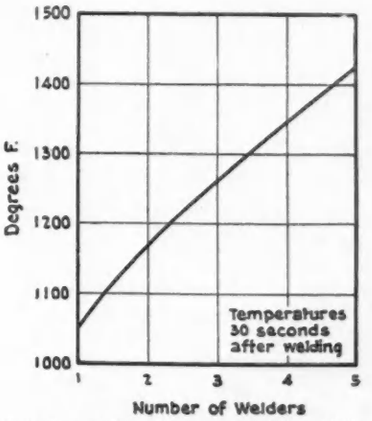
can be used when $\xi > 20$. Equation (8) is of the same order of approximation as equation (4). The time used in equation (4) must be increased by adding one-half of the time required for the bead under consideration. This arises because it was considered in the development of equation (4) that the bead was laid on instantaneously. The time used in the cooling factor $e^{-\lambda T}$ can be taken as T, the time after breaking arc, when the bead time is fairly short. If the bead time is long, such as is the case when one welder works on 7-inch casing, it is necessary to take an average time,



5½-in.-outside-diameter 0.300-in. plain-end joint; 2 welders; 2 beads; 150 amperes.

FIGURE 18

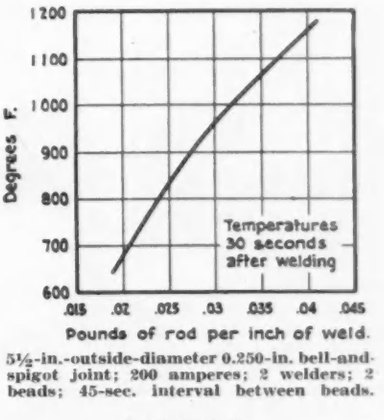
Variation in Time of Last Bead.



13¾-in.-outside-diameter 0.330-in. plain-end joint; 150 amperes; 2 beads; 45-sec. interval between beads.

FIGURE 19

Variation with Number of Welders



5½-in.-outside-diameter 0.250-in. bell-and-spigot joint; 200 amperes; 2 welders; 2 beads; 45-sec. interval between beads.

FIGURE 20

Variation with Pounds of Electrode Used.

which is $t + \frac{1}{2}$ (the time required for the bead). In any case when there is a question about the use of these various approximations, equation (2) can be used as a check.

Calculation of the Rate-of-Cooling Curves

In obtaining the rate-of-cooling curves it is possible to use the method of tangents and obtain them from the time-vs.-temperature curves, or to calculate them analytically as indicated by equation (5). Both of these methods are approximations, but the accurate method involves the numerical evaluation of the derivative of equation (2). The derivative of this equation is very simple, but the numerical evaluation of the derivative is quite tedious. Therefore, it is expedient to use the approximate equation (5) whenever possible. The tables[4] that list:

$$e^{\xi}[K_1(\xi) - K_0(\xi)]$$

do not extend farther than $\xi = 20$, and the following approximations must be used:

$$e^{\xi}[K_1(\xi) - K_0(\xi)] = \xi^{-\frac{3}{2}} \cdot \sqrt{\frac{\pi}{8}} \qquad (9)$$

Applying the Equation to Other Types of Casing

In order to change equations (2), (3), (4), and (5) so that we may consider welds such as bell-and-spigot, upset bell-and-spigot, upset plain-end, and slip-joint welds, it is necessary to make a correction for this additional ring of metal that is involved in each of these cases. These forms are fundamentally of the type that may be corrected by a correction factor applied to the thickness. In the case of bell-and-spigot this correction factor is:

$$1 + \frac{0.44}{\left(1 + e^{\frac{-l^2}{kt}} + e^{\frac{-4l^2}{kt}} + \ldots\right)} \qquad (10)$$

Where: 0.44 arises because the thickness of the bell is usually 0.88, the thickness of the spigot; and l is the length that the spigot extends into the bell. In case of upset bell-and-spigot 0.44 in equation (10) becomes 0.5. The treatment of the slip-joint is the same as that of the bell-and-spigot when proper correction is made for the thickness of the slip-ring. For upset plain-end casing the thickness correction is:

$$1 + \frac{b'}{\left(1 + e^{\frac{-l^2}{kt}} + e^{\frac{-4l^2}{kt}} + \ldots\right)} \qquad (11)$$

Where: l is the length of the pipe that has been upset, b is the thickness of the pipe, and b' is the fractional upset. Thus, for 25 per cent upset the factor would be:

$$1 + \frac{0.25}{1 + e^{\frac{-l^2}{kt}} + \ldots}$$

The exact mass of electrode deposited, and the exact velocity, must be considered individually when treating these different types of welds.

Conclusion

A theoretical equation has been developed and tested with a number of average experimental results. The agreement between the experimental and theoretical development indicates that we may put considerable confidence in this equation and the assumptions we have been forced to make in the development of this equation. It is with this confidence in mind that we proceed to push our theory beyond the conditions considered in the experimental tests. It might be said that we have merely used our theory to interpolate and extrapolate the experimental results. The only important departure from very close adherence to actual experimental knowledge is in the choice of the speed, and this relation is probably the best available until standard welding procedures have been developed completely and welders are timed during this standard procedure. By the use of this theory a number of trends that might be expected in casing welding have been presented in Figures 16 through 20. The only caution that need be observed in using this equation for the determination of the thermal behavior of cooling casing welds is in the choice of a speed of welding and heat transmitted to the casing by the welders.

The author wishes to thank the management of The Carter Oil Company for permitting the publication of this article.

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Canadian Fields

Steveville wildcat blows out; is put under control. Big possibilities seen for 200,000-acre structure.

Anglo-Canadian Oil Company, Limited's Steveville 2, Legal Subdivision 4, Section 14, Township 20, 11-w4, on a structure 130 miles east of Calgary, Alberta, Canada, blew out of control when the crew was arranging to set a packer on the drill stem to make a test for gas at the bottom of the hole. It blew an estimated 10,000,000 cubic feet of wet gas a day with a considerable quantity of heavy black crude before 500 bags of mud weighting material were pumped into the hole to bring it under control.

Erecting Storage Tanks

Drill stem was being removed and preparation made to run tubing. Storage tanks were being erected, and a test was to be made just as soon as the drilling fluid could be thinned out and taken from the hole. F. P. Byrne, Anglo-Canadian president, declared it "would be hard to estimate" the quantity of crude that blew with the gas, adding, "It may be 300 barrels and it may be many times that quantity." Gravity of the oil, in the absence of an analysis, was estimated at about 20 degrees. The strike was made at 3262 feet, 12 feet in the Devonian lime, and pressure at the surface was 1450 pounds per square inch. Any additional drilling which may be undertaken would be done slowly as it is not known whether water underlies the formation.

The structure contains approximately 200,000 acres, of which 65,000 acres are held under lease by the Anglo-Canadian Company, 50,000 acres by Standard Oil Company of California, with smaller blocks held by Anaconda Oil Company, Limited, Dawson Steveville Syndicate, and others. It offers attractive drilling prospects because of the comparative shallow depth of the lime, compared to the Madison limestone at 7000 to 8000 feet in Turner Valley, and the large volume of gas.

Heavy Crude Reserve

Besides indicating a new major Canadian oil field, the wildcat is welcomed as promising to furnish a heavy crude that, if development reveals is available in large quantities, would encourage investment of English capital in construction of a crude oil pipe line from Alberta to the Pacific Coast. The crude, of an asphaltic base and low gravity as compared to Turner Valley crude of a paraffine base with 36 to 65 gravity, would be suitable for use by ships of the British navy and find a market in British Columbia where large imports of fuel oil are made from United States and South American fields.

News of the strike was cabled to an Alberta delegation headed by Hon. N. E. Tanner, Alberta minister of lands and mines, currently in England to enlist British government support and aid of financial interest in construction of a pipeline that would broaden the present limited market for West Canadian operators.

HEADED FOR PHILIPPINES

Grant W. Corby, Los Angeles geologist and geophysicist, is on his way to the Philippines where he will resume his search for petroleum deposits there. Last year Corby geologized the properties of the Far East Oil Development Company on the Bondoc Peninsula of the northernmost island of Luzon, where present wildcatting is being carried on. This time he returns to the islands with a party of California geologists and geophysicists to do exploratory work for the Philippine government. Included in the party are Dr. Popenoe, paleontologist at Caltech, and a Mr. Hollister and Robert Kleinpell, geophysicist. Tentatively the exploration program is planned for one year.

Outpost Showing Also

The wildcat is the second test of the structure undertaken by the Anglo-Canadian company, one of the leading independent development firms active in Alberta. The company's No. 1, Legal Subdivision 2, Section 13, Township 21, 12-w4, 7½ miles southwest of the strike, was preparing to resume after cementing casing to the top of the lime at 3178 feet, where an oil show was reported. Anaconda Oil Company, Limited's Steveville 1, Legal Subdivision 15, Section 9, Township 22, 12-w4, was standing at 2505 feet, while Franco Oils, Limited, has staked a location on the west half of Section 34, Township 19, 10-w4.

With financing provided by E. L. Cord, Los Angeles industrialist, Terminal Oils, Limited, announced plans for three wells on South Alberta structures. Locations to be announced. They will be put down on the Del Bonita structure, where the company has proven existence of oil and gas in small quantities, on Twin River, southeast of Del Bonita, and on Spring Coulee, to the northwest.

In a key position northwest of the main group of crude wells on the southwest flank of Turner Valley, East Crest Oil Company, Limited's No. 4, Legal Subdivision 8, Section 6, Township 19, 2-w5, stopped drilling at 8037 feet and started cleaning out for a production test. Operators reported two producing zones in the Madison lime had been drilled, the first 100 feet thick and the second about 40 feet. Force and volume through the flare line indicated a good well.

Methane wells helping solve Italy's dilemma

A partial relief to Italy's dilemma of insufficient domestic production of motor fuels has been afforded by recent completion in the province of Rovigo of a number of wells producing gas with a remarkably high percentage of methane gas. It is said that wells slated for early completion will bring the province's yield of methane up to 4,591,000 cubic feet of gas, equivalent in terms of motor fuel to 1227 barrels of gasoline daily. These wells are being drilled along the border of the River

Po delta at Rosalina, Donada, Porto Viro, Contarino and Porto Tolle.

Rosalina field consists of 20 wells, all connected by pipe line to a plant now being constructed for liquefaction of the gas.

Motor busses on lines bordering the Adriatic Sea are being operated successfully with methane gas at a cost, it is said, less than they could be operated with gasoline. Auto rail cars, Venetian passenger boats and many motorcycles have been adapted to use methane.

Working on line across Isthmus of Tehuantepec

Reports from Mexico City are that work is progresing on the government's pipe line from Minatitlan, Vera Cruz, to Salina Cruz on the Pacific coast in an effort to expedite shipment of oil to Japan.

While the report did not stipulate the diameter of the line, the cost of crossing the Isthmus of Tehuantepec with it is estimated at $3,000,000. Pipe for the line was obtained from Germany in barter for oil.

Considerable work will have to be done at Salina Cruz, an abandoned port, before it can accommodate ocean going tankers. German shipping circles are said to be urging the Mexican government to push that portion of the project as rapidly as possible.

Reports of Mexico's intention to construct a pipe line from Mexico's producing fields across the Isthmus of Tehuantepec to the Pacific port of Salina Cruz are causing a certain amount of apprehension in Los Angeles among petroleum marketers.

The intention of building Salina Cruz into a port of maritime importance equipped as an oil shipping center and the fact that the Mexican government feels it will be in a position to offer Japan and all the Orient oil at a lower figure than anywhere else on the continent are somewhat disturbing to California exporters.

Mexican crude will furnish most of the throughput of the national refinery being built at Rio de Janeiro by the Brazilian government, according to a statement attributed to Santos Vahlis, prominent Brazilian business man, by the press of Mexico City. Santos is quoted as saying Brazil is arranging to purchase a large part of Mexico's production.

Rumania lists 49 rigs in operation

Data gathered by Mihail Pizanty of Bucharest on Rumanian drilling operations revealed that on April 27 there were 49 active rigs, all but 2 of which listed Meotic formation as the objective. The other two were Dacic sand projects.

Of the foregoing, 9 were projects of Astra Romana, 8 were being drilled by Unirea, 7 were wells of Romana Americana, and 5 were being put down by Concordia. Of the remainder, 3 each were listed for Colombia, Prahova, Creditul Minier and Group Petrolul Romanesc; Steaua Romana accounted for 4, while Foraky-Romaneasca and I. R. D. P. were drilling 2 each.

Divided by producing districts, these operations were distributed as follows: Tintea, 15; Ceptura and Ochiuri, 4 each; Moreni and Liliesti, 3 each; Boldesti, Gura Ocnitei, Surani-Unirea, Baicoi and Teis, 2 each; and 1 each for Berca (Buzau), Malaesti, Doicesti, Tetcani-Scorteni (Baucau), Margineni, Rasvad (Refoil), Calinet (Telega), Chitorani, Runcu Poenareanca-Koppes, and Comanesti (Bacau).

Pizanty's figures on footage revealed that 55,562 meters were drilled during the first quarter of 1939—of which 18,969 meters were drilled in January, 16,584 in February, and 20,009 in March. Of the quarter's total, Prahova district alone accounted for 49,322 of the meters drilled.

Crude production through the first quarter of the year amounted to 1,571,648 metric tons, divided by months as follows: January, 535,904; February, 497,025; March, 538,719, from which it may be seen that March was, up to that time, the peak month of 1939 in both footage and production.

Three hydrogenation plants will be built in France

Within the framework of the intensified measures of economic defense inaugurated during the current Daladier regime in France, Compagnie Francaise de Raffinage will erect three hydrogenation plants with an aggregate capacity of 130,000 tons. One of these, to be built at Donges and participated in by the state, will have a capacity of 70,000 tons and produce mainly light gasoline. A second, to be built at Martigues for hydrogenation of lignite, will have a capacity of 30,000 metric tons, while the third, to be built at Decazeville, will have the same capacity and will operate on coal.

Estonian shale oil and gasoline production up

Estonia's production of crude oil from shale in 1939 will amount to about 200,000 metric tons and its production of gasoline from the same product will amount to 19,000 tons, due to addition of two new plants, one state owned and one of the Swedish Oil Consortium, it is estimated by Bohrtechnicker-Zeitung. This will represent a substantial increase as 1938 production of crude from shale totaled 142,000 metric tons and gasoline, 16,000 tons. These latter figures in turn represented increases over the 1937 production figures, which were 112,000 tons of crude and 14,300 tons of gasoline.

Must finish early work in Portugal by October 7

The Anglo-Portuguese Oil Company, which holds a 50-year oil concession on all of Portugal, must complete preliminary geological and geophysical work by October 7, under terms of the original concession grant given to H. J. Pierce and Claude Hope-Moreley in April, 1938.

Upon completion of the work, selection of a site for drilling must be made within 6 months, but in this connection it is understood a tentative location has already been selected at a point 30 miles north of Lisbon.

Terms of the concession grant stipulate that in the event of development of commercial production, the domestic needs of Portugal must be taken care of before exportation of any of the oil will be allowed.

Capital of the company is £250,000, or about $1,250,000.

Large concession holder surrenders Papua permits

After spending about $2,150,000 on four exploratory permits with an aggregate area of 31,000 square miles, Papua Oil Development Company has withdrawn from Papua, concluding that the prospects for discovery of oil within the boundaries of its permits unfavorable.

The company's parties have been withdrawn from the field and the permits have been surrendered, according to a statement issued in Melbourne, Victoria, Australia, by Vernon Smith, managing director.

Papua Oil Development Company, active on the Papuan permits for two years, is an affiliate of Shell Company of Australia, of which Smith is general manager.

Two wildcats planned for Victoria, Australia

Western Petroleum and Producing Oilfields, Australian organizations, will drill two test wells in Victoria soon, according to F. E. Levy, head of the former company. One wildcat will be located at Portland, the other at Nelson. The sites selected were the results of geological and geophysical investigation.

Standard's production in Venezuela 8,173,325 barrels

Venezuelian oil production of Standard Oil Company of New Jersey interests during April totaled 8,173,325 barrels, a daily average of 272,479 barrels. Of the total, Lago Petroleum Company production amounted to 5,370,119 barrels, or 179,039 barrels daily average, and Creole Petroleum Corporation production totaled 2,803,206 barrels, or 93,440 barrels daily average.

Shell building airport on Ecuador concession

Shell Oil Company of Ecuador is building an airport on a large concession in that country preparatory to commencement of preliminary aerial geologizing of the holding.

This company is a new one formed specifically to acquire, develop and exploit a 9 or 10 million hectare concession granted August 9, 1937, to Anglo-Saxon Petroleum Company. The capital is held jointly by Canadian Eagle Oil Company and other concerns in the Royal Dutch Shell group.

MEN IN THE INDUSTRY'S NEWS

JOHN M. MOUSER has been named district manager at the Houston office of Midstates Oil Corporation, vice S. D. Butcher, who resigned to operate independently. Mouser was head of the company's land department at Tulsa, Oklahoma before the transfer.

LESTER G. METCALFE has been appointed manager of marine operations for Union Oil Company of California, succeeding William Groundwater, resigned. Formerly manager of manufacturing, Metcalf has been associated with the company for the past 25 years. He is a graduate of Pomona College and Massachusetts Institute of Technology.

CARL WIRTH, engineer, has been appointed as gas engineer by the new Michigan Public Service Commission, which replaced the Public Utilities Commission this spring. Wirth was employed as gas engineer by the old commission two years ago.

RILEY MAXWELL, geologist for Oil States Exploration Company, has been elected president of the newly formed Abilene Geological Society, which will become affiliated with the West Texas Geological Society. Other officers are: Carl S. Shoults, Abilene consulting geologist, vice president; and Gene Boehms, Forest Development Corporation, secretary-treasurer.

W. W. LECHNER, Dallas oil producer, staged a house warming for his recently completed summer home on Eagle Mountain Lake, near Fort Worth, on May 13 when the Wort Worth Chamber of Commerce sponsored a barbecue and outing for a large gathering of Texas oil men. Lechner's lorge has dormitories that will provide sleeping accommodations for more than 100 guests.

GEORGE E. BURTON, district geologist for Sun Oil Company in West Texas and New Mexico, has announced that headquarters will be transferred from San Angelo to Midland late this month. J. E. Dickson, district land man, and C. M. Chase, scout, will also be located at Midland.

J. O. HARPER, scout for The Pure Oil Company in West Texas, with headquarters at Lubbock, has been transferred to Wichita Falls, where the company is enlarging its personnel. Jimmie S. Lock, formerly at Wichita Falls, has been assigned to scouting duty with headquarters at Hobbs, New Mexico.

WILLIAM C. McDUFFIE of Los Angeles, director of Blue Goose Oil Company, operating on the Agua Caliente structure in the Pachitea region of Peru, is spending several weeks in London. McDuffie served for several years with the Royal Dutch Shell group and later was connected with Richfield Oil Company.

HENRY L. DOHERTY was honored last week with organization of the "Henry L. Doherty Educational Foundation," to provide scholarships for children of the Cities Service organization's personnel. The announcement, made May 15, marked Mr. Doherty's 69th birthday.

ROBERT L. HAND, vice president and general manager of the marine department of Standard Oil Company of New Jersey, has been named to the board of directors of the American Merchant Marine Institute. He succeeds the late Robert L. Hague, whom he succeeded in his position with Standard Oil Company, and will represent the tanker operators on the institute board.

C. C. RICHARDS, C. O. Holloway and A. L. Slaughter have organized Richards & Holloway, Inc., as a Texas oil firm. Headquarters have been established at Tyler.

J. B. AUG. KESSLER, London executive of the Royal Dutch Shell group, and Col. H. E. Medlicott, with Anglo-Iranian Oil Company in London, recently traveled to Rumania as members of the British Trade Mission.

E. WATKINS, port superintendent of La Libertad, Ecuador, for Anglo-Ecuadorean Oilfields, was scheduled to leave for England on a three-month vacation in May. William Nicoll of Liverpool is to take over Watkins' duties during the period.

TOM JOHNSON, Wichita operator, last week named 20 operators and major company representatives to serve as a committee to draft new rules and regulations in administration of Kansas proration laws by the State Corporation Commission. Amendments to the proration laws effected during the recent legislative session make necessary changes in the rules and regulations.

Committee members are: N. M. Hutchinson, Bartlesville, Oklahoma, Cities Service Oil Company; Don R. Knowlton, Bartlesville, Phillips Petroleum Company; M. J. Kirwin, Indian Territory Illuminating Company; Arthur Brewer, Winfield operator; John M. Little, Wichita, Vickers Petroleum Company; A. S. Ritchie, Wichita, McPherson Drilling Company; E. B. Shawver, Wichita operator; William L. Ainsworth, Wichita, Mid-Plains Oil Company; O. E. Sutter, Wichita, Wolf Creek Oil Company; W. L. Hartman, Wichita operator; C. H. Keplinger, Wichita, Shell Oil Company; Ted Gore, Wichita, Central Petroleum Company; J. H. Cromwell, Wichita, Cromwell & Lewis; D. C. Bothwell, Tulsa, Darby Petroleum Company; Frank Pickell, Tulsa, Stanolind Oil & Gas Company; M. L. Perry, Tulsa, The Texas Company; R. S. Knappen, Tulsa, Gulf Oil Corporation; H. E. Wamsley, Hutchinson, Skelly Oil Company; Dr. E. A. Stephenson, Lawrence, University of Kansas, and R. Van A. Mills, Ponca City, Continental Oil Company.

ROBERT HANEY, Dale Browning and Arthur B. McColm have organized Waskom-Bethany Oil Company as a Texas corporation with headquarters in Dallas, to operate as a drilling firm.

JUDGE ERNEST E. BLINCOE, Fort Scott, has resigned, effective June 1, from the Kansas Corporation Commission. His term expired March 20, but he was continuing to serve pending appointment of a succesor by Governor Payne H. Ratner.

L. H. SIMPSON, vice president of J. K. Hughes Oil Company, has been elected president of Mexia, Texas, Rotary Club.

DIED:

RICHARD H. MORRISON, New York, vice president of California-Texas Oil Company, recently was killed as a result of a hot water heater explosion in a vacation bungalow on Catalina Island near Avalon, California. Morrison formerly was manager of the southern district of The California Company at Dallas.

JOSEPH FREDERICK RITCHIE, 75, who drilled the first oil well in the Cardston district of Alberta in 1884, and figured in later West Canadian oil development, died May 11 in Prince Rupert, British Columbia, after a lengthy illness. Also noted as a land surveyor, he surveyed the townsite of Rossland, British Columbia, of which he was one-third owner, and sold 80,000 acres of land surrounding the present town of Cardston to Mormon settlers. Surviving are his widow, one son and one brother.

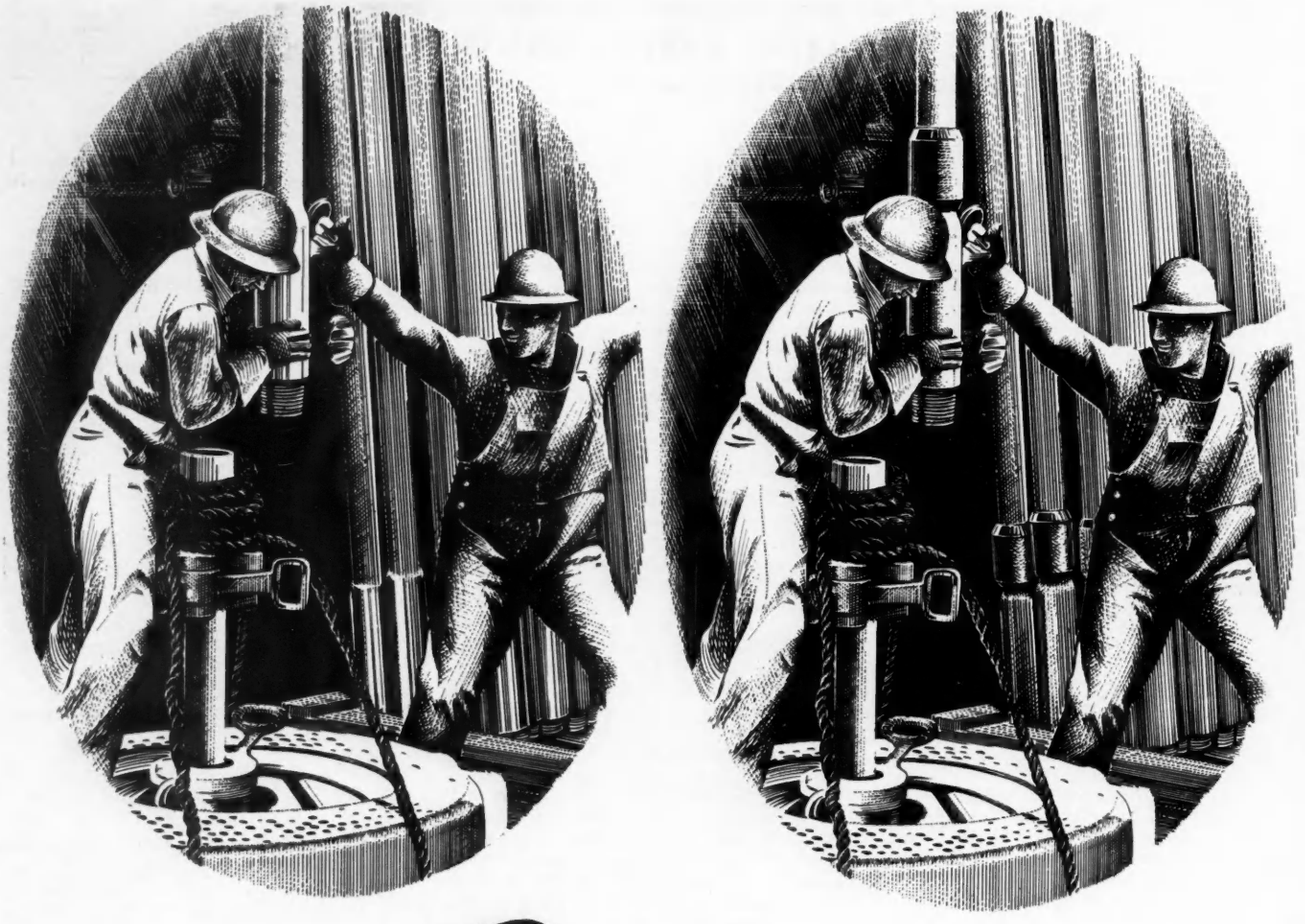
HENRY ROSENTHAL, 58, independent operator and drilling contractor, who first operated near Bradford, Pennsylvania, and later in Kansas, Oklahoma, Texas, Kentucky, Illinois, Indiana and Ohio, died in a hospital at Vandalia, Illinois, May 12, after a brief illness. Organizer of Aladdin Petroleum Corporation, Spring-Rose Drilling Company and Rose-Spring Drilling Company, he had been operating independently in Illinois and Indiana at the time of his death. He was credited with opening the St. James pool in the Southern Illinois basin. Funeral services were held in Wichita, and burial was at Oklahoma City.

K. A. GARRISON, land man for Stanolind Oil & Gas Company in Houston, and Mrs. Garrison were burned to death May 14 in a fire that ruined their new home. Both were apparently overcome by smoke before they were fully awakened. Garrison had been with the Stanolind Company 4 years, coming to Houston from San Antonio 3 years ago.

DAVID E. COFFMAN, 45, attorney and substantial oil producer in the East Texas field, died May 12 in a Dallas hospital after being ill 10 days, having a stomach and throat ailment. He had resided in Dallas 25 years.

ROY I. TAYLOR, 62, of Mount Pleasant, veteran of the Spanish and World Wars, and first managing secretary of the Michigan Oil and Gas Exposition (1935), died here May 13 following an auto accident.

V. E. HENNINGER, 43, Michigan manager of Wittmer Oil Company since 1929, recently died in Ford Hospital in Detroit following an illness of several months. Burial was at Butler, Pennsylvania.



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THE WEEK'S NEWS SUMMARIZED

Anti-Trust

Acceleration of the government's anti-trust campaign against the oil industry was evidenced by several developments that took place last week:

(1) The Department of Justice announced a grand jury investigation would be initiated at Danville, Illinois, June 5. Basis of the new proceedings will be the same practices as were involved in the Madison trial.

(2) Impanelment of a California grand jury to investigate alleged violations of the anti-trust act on the Pacific Coast will start May 26.

(3) The House appropriations committee on May 18 recommended the appropriation of an additional $520,000 for anti-trust activities. In testifying before the committee last month, Assistant Attorney General Arnold explained the oil situation in considerable detail.

(4) The new head of the Department of Justice, Attorney General Frank Murphy, made it known May 18 that there would be no material changes in the anti-trust policies, stating the existing policy of vigorous enforcement will be continued.

The above developments imperil the new "round-table" friendly policy that the Temporary National Economic Committee had promised in its investigation of monopolistic conditions in the petroleum industry. Among the oil company officials subpoenaed to appear at Danville were a number who were expected to participate in the TNEC proceedings.

Still another anti-trust development took place at Chicago last week. Twelve major oil companies and five oil company officials convicted in the old Madison trial 16 months ago took their first steps for vindication to the U. S. Circuit Court of Appeals. The court heard arguments on appeal motions previously filed, and took the matter under advisement.

Courts

The U. S. Supreme Court May 15 reversed a lower court ruling, and declared there was no doubt of the intent of Congress to continue the penalty as well as other provisions of the Connally hot oil act when it extended the statute until June 30, 1939. The lower court had held Neal Powers and Renee Allred could not be prosecuted after June 15, 1937, for violation occurring before that date.

The Department of Justice has asked for the vacating of a consent decree entered in the Columbia Gas and Electric case, in order that new proceedings may be brought for divorce of Panhandle Eastern Pipe Line Company. It was declared by the department that the two indicated they were prepared to undertake such divestment and asked for time, which was granted, but that 4½ months have since elapsed and no plan has yet been presented.

Proration

There is no necessity for enacting oil proration legislation during the current session, the Illinois legislature was told last week in a report filed by its special oil industry investigating committee. The report, however, did make six recommendations for legislation on oil, including among others the filing of log data, an amended plugging law, the drilling of offset, and meters on pipe lines.

Another oil production control bill designed to give legal status to the present voluntary control program has been introduced in the California legislature. The bill would make quotas set up by a control board enforceable as a state law.

Declaring Texas has done more than its share, Railroad Commissioner Jerry Sadler has recommended that the state open up its wells when its present proration order expires on July 1.

Capitols

Hearings on legislation requiring divorcement of marketing from other branches of the oil industry will be held by a House Judiciary Subcommittee May 24.

For the first time a proposal for compulsory use of alcohol in gasoline has been referred to a special subcommittee by the Senate. The bill would require the blending of 7 percent domestic alcohol with motor fuels. The committee is also to consider an amendment to require a 10 percent blend.

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Anti-Trust Activities

Reopening of matters investigated at Madison proposed in Illinois court . . . California to start investigation . . . More money given for prosecution.

Federal jury in Illinois to reopen Madison matters

Acceleration of the government's anti-trust campaign against the oil industry was evidenced last week by the initiation of steps to develop new suits against the major companies in the ten Middle West states.

Following on the heels of an announcement that the Southern California situation would shortly be laid before a grand jury, it was disclosed by the Department of Justice May 17 that a grand jury investigation will be initiated at Danville, Illinois, June 5.

Subpoenas for the appearance of witnesses before the grand jury have already been issued, it was revealed.

Basis of the new proceedings will be the same practices as were involved in the Madison case which the department this month took to the Supreme Court, with an appeal for review of a decision of the Seventh Circuit Court of Appeals rejecting a petition for reversal of the decision of District Court Judge Patrick T. Stone dismissing indictments against 11 defendants against whom guilty verdicts had been returned by the jury which heard the trial.

"The department is in the possession of evidence indicating that many of the practices complained of in the indictments against the major oil companies returned at Madison, Wisconsin, in 1936 have not been wholly abandoned in the oil industry," it was explained by Assistant Attorney General Thurman Arnold, head of the anti-trust division, in a formal announcement of the new proceedings.

"There is reason to believe that the price levels for gasoline in this area have continued to a large extent to be artificially maintained and that many of the terms under which gasoline jobbers are permitted to do business with the major oil companies remain rigid and restricted. An explanation of these later conditions will be sought in the present investigation."

New Defendants

Prominent among the witnesses to be interrogated at Danville will be company officials who were not questioned by the Madison grand jury because of their refusal to waive immunity, but who in 1937 were convicted and paid fines upon pleas of nolo contendere. Having thus been punished, these officials can not again be prosecuted for the same transactions, it was pointed out, but their evidence can be demanded in the effort to build up a case against others.

"The grand jury at Madison, which returned the 1936 indictments still pending against a number of the defendants, did not in its investigation have the benefit of the testimony of those persons whom it made parties defendant," Arnold said. "Nevertheless, those very persons, being active for their respective companies in the conduct of the matters complained of in the indictments, are in the best positions possible to know accurately all the facts relating to the matters complained of.

"For the Madison grand jury to have summoned these persons to throw light upon the investigation it was then conducting would have resulted in providing them with immunity from prosecution. Many of them indicated that they would claim their lawful privileges against self-incrimination and would furnish information in their possession only in return for immunity, which the government, in view of the circumstances and the apparent gravity of the offenses, did not then feel free to grant.

"Now, since these persons have entered pleas and paid fines and may not under the law be prosecuted again for the same transactions, the grand jury at Danville is in the position to compel them to disclose all the facts within their knowledge relating to these questions. They can now safely be accorded immunity from any further prosecution based on such disclosures as they may now make."

The new grand jury investigation, the purpose of which is "to uncover completely the relevant facts and test the prima facie case of violation of the Sherman Act by evidence under oath," will be a protection to possible offenders rather than a weapon against them, the Assistant Attorney General declared.

"It is a means of testing the accuracy of information given by complainants themselves as well as those complained against," he explained. "It is a safeguard against prosecutions brought on information which will not stand the test of investigation under oath. Therefore, the calling of the grand jury should not be construed as an implication of guilt on the part of any of the persons subpoenaed. The grand jury investigation is used not for the purpose of presenting the minimum evidence necessary to obtain an indictment but to investigate all of the facts."

Grand jury to investigate California oil marketing

United States District Judge Paul J. McCormick has ordered impanelment of a special California grand jury to investigate alleged violations of the Sherman Anti-Trust Act by Pacific Coast oil companies, selection of the jurors to start May 26.

Evidence collected during the past two years will be presented to the grand jury as will records from the oil companies' files, it is said.

The inquiry was launched following complaints that competition in marketing of petroleum products on the coast was being eliminated through agreements by the operating heads of the companies.

Assistant Attorney General Thurman Arnold said recently that major companies in California produce and distribute over 80 percent of the gasoline marketed on the coast.

Vigorous enforcement of anti-trust statutes planned

No material changes will be made in the anti-trust enforcement policy laid down by Former Attorney General Homer Cummings and prosecuted by Assistant Attorney General Thurman W. Arnold, it is disclosed by Attorney General Frank Murphy.

Views of the new head of the Department of Justice on the enforcement of the anti-monopoly statutes were made known May 18 in a formal statement in which he called for " a consistent continuity of action and policy, based upon the declared purpose of Congress to maintain and foster our free competitive system.

"It will be our aim, therefore," he said, "to continue the existing policy of vigorous enforcement, employing whatever legal means are necessary and appropriate to ensure compliance with the statute. The purpose of this statement is not to announce a new policy but, if possible, to make the position of the government in respect to the anti-trust laws better understood."

Criminal proceedings will not be employed in an "irresponsible manner," the attorney general promised, but they will not be abandoned since, he said, "it must be recognized that if injunction by civil decree were the sole consequence of violating the laws they would soon become ineffective."

"It has been frequently suggested that some kind of agency or machinery should be provided which could advise business concerns in advance how far they can go without incurring the risk of criminal penalties," Murphy commented.

"The Department of Justice has no authority to give advisory opinions with respect to specific agreements, the legal effect of which may depend much more upon the manner in which they are carried out than upon the express terms in which they are couched. It cannot do so without too greatly complicating its task and hindering the work of enforcement."

However, he added, "the department will endeavor to make its own views as to what the law requires of business men as clear and as unequivocal as possible. In this way, it hopes to be genuinely helpful to business men seeking by voluntary action to eliminate business practices which are economically harmful to industry, to competitors and to the general public. The department has, of course, no authority to grant immunity from the anti-trust laws or to modify or suspend them."

Of special interest to members of the oil industry were the attorney general's views as to how violations of the anti-trust laws should be handled.

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ment, so far as its facilities permit, to prosecute every substantial violation of the law that is brought to its attention, it will not be content with sporadic prosecution of individual or isolated cases," he declared.

"Where it finds, for example, that the production or distribution of a particular commodity is being adversely affected by practices which it deems contrary to the anti-trust laws, it will be the policy of the department to include in a single proceeding all the groups and individuals whose illegal activities affect or contribute to the situation that needs to be remedied. In any case, this method of proceeding will be commensurate in scope and effect with the conditions that need correction and with the broader purposes of the laws themselves."

Congress appropriates more funds for trust work

Paving the way for further suits against the oil industry, the House appropriations committee on May 18 recommended the appropriation of increased funds for the anti-trust division of the Department of Justice.

Reporting the departmental money bill for the fiscal year beginning June 1, the committee included an increase of $520,000 for the anti-trust activities of Assistant Attorney General Thurman W. Arnold, giving him a total of $1,300,000. This was less by $230,000 than the sum asked for by Arnold.

The increased fund, in addition to financing new suits against the oil and other industries against which the department now is campaigning, will provide for the establishment of regional offices in a number of cities, including New York, Chicago, San Francisco, Oklahoma City and Atlanta, most of them in areas where the government is having "oil trouble."

Decision to add to the anti-trust division's fund was reached by the committee, which in March refused to give Arnold an immediate appropriation of $70,000 with which to proceed at once against the oil and motion picture industries—two largest targets of the department's campaign, following hearings at which the assistant attorney general detailed his program and ambitions.

Much of the testimony, the committee explained, was of a confidential nature. On the whole, its report added, "the committee was convinced that some measurable enlargement of the activities of this division is essential, if the anti-trust laws are to be given a reasonable degree of enforcement," and it was felt the program should be undertaken, "not alone for the protection of the consumer but for the protection of business itself."

"The program is not intended to be one of violent 'trust busting' but rather is predicated upon the necessity of a series of investigations and prosecutions in certain industries that at the present time are palpably violating both the spirit and the letter of anti-trust legislation," the committee commented.

"Much of the beneficial result of these activities can doubtless be obtained through the relatively simple means of a consent decree. Such procedure tends to establish a certain pattern of permissive action which, pieced together one by one, should serve as compelling traffic lights to business in determining whether to go or stop along any thoroughfare of business activity and practices."

Arnold Testifies on Oil

Testifying before the committee last month, Arnold, at the request of Representative Thomas S. McMillan (Democrat, South Carolina), chairman, explained the oil situation in considerable detail, declaring that "our prosecutions in the case of the oil industry in the past have suffered from the lack of completely nation-wide organized efforts and funds."

The Madison case, he said, cost $150,000; "it lasted a long time, and is still going on, due to a rather unfortunate situation."

Responding to a comment by the chairman that the major companies are underselling the independent distributors, Arnold explained that "We hit it in Madison once, and then we went out to the Pacific Coast and hit it again, and we have a suit pending in New York; but we have not got this cover-all suit.

"The issue ought to be raised as to whether the oil companies must not divest themselves of the control of these filling stations," he said.

"My point is this: that either we are going to have competition in the oil industry or, if that is impossible, it has got to go to Congress for regulation —one of the two. I would like to get enough men to cover that on a national scale instead of by piecemeal."

Arnold's request for increased funds was supported by Paul E. Hadlick, secretary of the National Oil Marketers' Association, who told the committee that the independents "are on the way out" and that the only thing that will save them is adequate enforcement of the anti-trust laws "which will include the bringing some actions to divorce some of these activities, or the enactment of pipe-line and marketing divorcement legislation."

"The Department of Justice has never had enough money to adequately enforce the anti-trust laws," Hadlick said. "If you gave them $5,000,000 they would never have to spend all of it to enforce properly the anti-trust laws, but the very fact that the Department of Justice was ready, willing and able, with an adequate staff and adequate money, to go out and employ private counsel when necessary, to enforce the anti-trust laws, would put a stop to a great many growing conspiracies in this country."

The great expenditures which the integrated companies make in their marketing activities, he declared, lead to income losses which are reflected in federal income tax collections. "These people pay very little on their net income because they are using it to build palatial stations in marketing to offset the time when they will completely control marketing," he said; "and if they ever get control, it will be like the pipe lines, because when the pipe lines were independent, rates were down. Once they eventually get rid of the independents in this business, these (marketing activities) will no longer show a loss."

New prosecution endangers friendly monopoly hearings

Initiation by the Department of Justice of its Danville, Illinois, grand jury investigation of major oil company practices at the same time approximately as the Temporary National Economic Committee is due to open its investigation of monopolistic conditions in the petroleum industry may largely diminish the effects of the latter and imperil its new "round table" policy which is to be tried out on the industry.

Among the oil-company officials subpoenaed to appear at Danville, it is understood, are a number of men who were expected to participate in the Washington proceedings.

Considerable speculation is current in Washington as to whether the Department of Justice's action was undertaken as a demonstration that it is not to be deterred by the results of the Madison prosecution, still uncompleted, or was a result of pique of department officials over the administration monopoly committee's decision to abandon the "prosecution" policy which has marked its studies of other industries in favor of a more friendly method under which members of industry themselves would be asked to express their views as to conditions which needed correction rather than be used as a target for accusations hurled at them by administration officials.

Originally, it is understood, the Department of Justice was cast for a major role in the oil monopoly investigation and was preparing an indictment of the integrated companies for practices such as those involved in the Madison cases, to be used as a basis for sharp questioning of company officials who were to be called as witnesses. Under the new method proposed to be adopted by the committee, the department was seen as being relegated to a secondary position.

On the other hand, the initiation of the Danville investigation at this time is seen as the department's way of serving notice that it does not consider the results of the Madison prosecutions as final but believes that more definitely favorable results might be attained in another jurisdiction.

In this, the department has a precedent in the motion picture cases which failed in the Middle West but were later successful in the East, when identical charges were tried before a "more enlightened" jury.

Regardless of the motives which prompted department officials to take the path they are following, however, it is considered probable that oil company officials, who had looked to the monopoly investigation as offering a possible basis for a better understanding between the industry and the government, may be reluctant to come to Washington and talk freely with members of the TNEC, in view of the fact that any disclosures of improper practices might be used against the industry.

At the same time, the Danville grand jury investigation may serve to keep important executives in that city for a considerable period, effectively preventing their appearance before Senator O'Mahoney's group and depriving the latter of views and information which might be important in the framing of any legislation resulting from the monopoly investigation.

Chicago court hears argument in Madison case appeal

Twelve major oil companies and five oil company officials, convicted in federal court at Madison, Wisconsin, 16 months ago of conspiracy to violate the anti-trust laws through operation of buying programs in the East Texas and Mid-Continent fields following invalidation of the National Recovery Act, took their fight for vindication to the United States Circuit Court of Appeals at Chicago last week. The court heard arguments on appeal motions previously filed, and took the matter under advisement.

William J. Donovan, New York, chief defense counsel, told the appeals court that "evidence to show that the federal petroleum administration encouraged and cooperated with the defendants in the activities for which they were convicted was excluded by the trial judge." Evidence excluded by Federal Judge Patrick T. Stone, he said, would have shown the encouragement and cooperation of the federal petroleum administration with the defendants, and would have provided the trial jury with a background necessary for the defense in presentation of its case.

Donovan reviewed state attempts to control over-production, which failed and resulted in price wars that even the federal department of interior could not settle by regulations. When it became apparent that order could be restored only through cooperation, Charles E. Arnott, New York, vice president of Socony-Vacuum Oil Company, one of the defendants, and who was characterized by prosecuting attorneys during the trial as the "master mind" of the conspiracy as chairman of a marketing sub-committee of the industry's planning and coordination committee, was called upon by the federal government to act. The buying programs forming the basis of the indictment were the result of Arnott's efforts to remove distress gasoline from the mid-west market and end price wars, the court was told.

Numerous errors allegedly made during the course of the four-month trial were also cited by defense counsel, among them use of transcript of grand jury testimony in the government's examination of witnesses, statements to the jury by government atorneys that witnesses in the employ of the defendants were under pressure from their employers, and suggestion of additional alleged facts not covered by the testimony.

During the two-day hearing, members of the appeals court indicated interest in the use of grand jury testimony before examination by the witness or defense counsel, and during questioning brought out the fact that gasoline prices in the territory outside that covered by the indictment advanced to a greater extent in the period covered by the indictment than in the midwestern states.

Grant W. Kelleher, government counsel, told the appeals court that the practices on which the indictment was based were outlawed with invalidation of the NRA, and in 1934 Secretary of the Interior Harold Ickes suspended the oil-buying program because of its doubtful legality. Charles H. Weston, special assistant to the attorney general, told the court that price-fixing agreements were made by which the major companies could control the source of gasoline and oil in the mid-western market.

The contention of government counsel that neither the Secretary of the Interior nor the Petroleum Administrative Board knew of the buying programs under which the indictment was based was answered by Donovan in rebuttal when he quoted the following from the board's report: "As the various problems were offered for discussion at the general stabilization committee meetings, sub-committees were appointed to make reocmmendations. One of the most important was the tank-car committee, which attempted to get the tank-car market raised more in line with the price of crude recovery cost on the theory that a firm tank-car market was essential to a stabilized retail structure."

Defendants taking the appeal comprise one of three groups formed by Judge Stone after a jury of small town businessmen and farmers found 16 companies and 30 individuals guilty of charges of the indictment. After giving several months to study of evidence presented during the trial, Judge Stone dismissed the charges against one company and 10 individuals, granted new trial to 3 companies and 15 individuals, and fined the remaining 12 companies and 5 individuals a total of $65,000. Government counsel have asked the United States Supreme Court to set aside that part of the lower court's order by which 1 company and 10 individuals were freed, while a new trial has been scheduled to start before Federal Judge Walter Lindley at Madison on October 2 for the second group.

Companies before the Chicago appeals court last week were Socony-Vacuum Oil Company, Continental Oil Company, Shell Petroleum Company, Sinclair Refining Company, The Pure Oil Company, Mid-Continent Petroleum Corporation, Phillips Petroleum Company, Skelly Oil Company, Globe Oil & Refining Company of Oklahoma, Globe Oil & Refining Company of Illinois, Empire Oil & Refining Company and Wadhams Oil Company.

Individuals were Charles E. Arnott, New York, vice president of Socony-Vacuum Oil Company; H. T. Ashton, St. Louis, manager of the Lubrite division, Socony-Vacuum Oil Company; P. E. Lakin, St. Louis, general sales manager, Shell Petroleum Corporation; Robert W. McDowell, Tulsa, vice president, Mid-Continent Petroleum Corporation, and R. H. McElroy, Jr., Chicago, tank car sales manager, The Pure Oil Company.

Oil in the Courts

Supreme Court reverses Houston ruling on Connally Act prosecution, holding penalty provisions kept in force. U. S. would hurry Panhandle Eastern sale.

Move to accelerate divorce of Panhandle Eastern

Vacating of a consent decree entered on January 29, 1936, in the Columbia Gas and Electric case, in order that new proceedings may be brought for divorce of the Panhandle Eastern Pipe Line Company, was asked of the District Court at Wilmington, Delaware, May 15, by the Department of Justice.

The case was initiated in the fall of 1935 to divorce Columbia Gas and the pipe line company and to maintain the latter in a position of free and independent action in the production, transmission and distribution of natural gas in order that it might provide natural gas from Texas and Kansas to large areas in Michigan, Ohio and Indiana. The suit was halted by the consent decree in 1936.

"Three years of experience under this decree have made it increasingly clear that it has been inadequate to achieve its declared purpose," it was explained by the department, and as a result of repeated but unsatisfactory efforts by the Government to realize its objectives the companies were informed last December that the existing situation was inconsistent with the purposes of the decree and the requirements of law, and could not be permitted to continue; nothing less than a complete divestment by Columbia Gas & Electric Corporation and its subsidiary, Columbia Oil & Gasoline Corporation, of all their holdings in Panhandle Eastern Pipe Line Company would suffice.

The two corporations indicated they were prepared to undertake such a divestment and asked for time, which was granted, but, it was declared by the Department, "four and a half months have since elapsed, and no plan has yet been presented by Columbia Gas & Electric Corporation and Columbia Oil & Gasoline Corporation which would, in the judgment of the department, realize the purposes of the decree and thus bring about a situation in conformity with law.

"In consequence, the department has concluded that it is necessary to move to vacate the consent decree of January 29, 1936, and to proceed to a determination of all of the issues between the department and the defendants through full litigation."

High court holds Connally act has been continuous

Declaring there was no doubt of the intent of Congress to continue the penalty as well as other provisions of the Connally "hot" oil act continuing that statute in effect until June 30, 1939,

the Supreme Court on May 15 reversed a decision of the Federal District Court for the Southern District of Texas holding that Neal Powers and Renne Allred could not be prosecuted after June 15, 1937, for violations occurring before that date.

Powers and Allred were indicted on September 17, 1938, on charges of violation of the act by transporting in interstate commerce from the Conroe (Texas) oil field to Marcus Hook, Pa., petroleum products in excess of the amounts allowable under the Texas proration law and the regulations and orders of the Texas Railroad Commission. The offenses were alleged to have occured on various dates from November 4, 1935, to March 20, 1936. The case was quashed in the district court on the ground that Congress, in extending the act, had failed to specify that the penalty provisions also were to be extended and that, accordingly, offenses occurring under the original law could not be prosecuted after June 15, 1937, its original expiration date.

Pointing out that only Congress may declare whether those who, before June 16, 1937, violated the act may be prosecuted thereafter, Asosciate Justice William O. Douglas, delivering his first opinion as a member of the court, held that there could be no question as to continuous application of the penalty provisions for the act, as originally written was "a self-sustained and organic whole, equipped to effectuate a declared policy of the Congress." Further, he said, the act did not expire on its original date, but was continued as a whole until June 30, 1939.

"Its substantive phases were not altered one whit or tittle; its sanctions were neither reduced nor increased," Justice Douglas said. "Precisely the same acts continue to be prohibited after the amendment as before. The amendment merely perpetuated the entire act for another term.

"It seems clear beyond question that it was the purpose of Congress, expressed in the amendment of June 14, 1937, to treat this act precisely in the same way as if by its original terms it was to expire on June 30, 1939," he added.

Due to the amendment, the act has never ceased to be in effect, the opinion held. No new law was created; no old one was repealed, but without hiatus of any kind, the original act was given extended life.

"There was no First Connally Act followed by a Second Connally Act," it pointed out. "During the periods in question there was but one act. No evidence has been brought to our attention, and we have found none, that Congress proposed to waive or to pardon violations which occurred prior to June 16, 1937, but which were not prosecuted until subsequent thereto."

In fact, Justice Douglas continued, if the claim of the appellees was upheld temporary measures, such as the Connally Act, would lose some of their sanctions. "Violations could occur with impunity months before its expiry, for in practice there frequently is an unavoidably substantial lag between violation and prosecution," he pointed out. "We are unwilling to conclude that although the same acts continue to be prohibited after June 16, 1937, as before, violations committed prior to that date are not punishable thereafter."

At the same time, he said, even though the act be treated as having expired or terminated on June 16, 1937, the same conclusion must be reached even in the face of the appellees' argument based on a statement of Chief Justice Marshall that an offense against a temporary act cannot be punished after its expiration unless particular provision be made by law for the purpose.

"For in this case 'particular provision' has ben made 'by law for the purpose' of extending the enforcement machinery with reference to prior criminal violations," Justice Douglas said. "The 'particular provision' was the amendment of June 14, 1937, extending the effective period of the act. That amendment was passed prior to the original expiration date. When read in light of the title of the amendatory statute, viz. 'An Act to continue in effect until June 30, 1939, the Act . . . approved February 22, 1935,' the statement of purpose becomes plain and ambigious. If the amendment of June 14, 1937, has merely 'extended' the duration, or postponed the expiration, of Section 10 of the act dealing with criminal penalties, 'particular provision' for subsequent prosecutions would have been indubitably clear. The fact that all sections, including Section 10, were extended, makes it nonetheless plain. The whole, though larger than any of its parts, does not necessarily obscure their separate identities."

Superior wins declaratory ruling in Indiana suit

Superior Oil Company has been granted a declaratory judgment requiring New Harmony Realty Company to accept rental payments on a five-year lease covering Ribeyre Island (Indiana) acreage. The action was filed in Circuit Court of Posey County, and the decision rendered by Judge Herdis F. Clements.

Charles I. Dawson, president of the New Harmony company, advised the Superior company March 9 that rental payments on the acreage would not be accepted June 18, when due, as the company had not drilled on the acreage during the first year of the five-year lease. The court action was taken by the Superior company to compel acceptance of rental payments regardless of whether or not drilling had been started by June 18.

Attorneys for New Harmony Company were planning to appeal the case to the state appellate court.

Proration Picture

Illinois investigators against control measures at this time . . . Michigan set-up completed . . . Sadler proposes opening up Texas to force others in line.

Illinois investigators see no need for proration

The Illinois legislature was told "there is no necessity" of enacting oil proration legislation during the current session, in a report filed by its special oil industry investigating committee last week. The committee did, however, make six recommendations for legislation on production, transportation and distributing questions which were described as receiving "little or no dissent" during hearings conducted by the investigating body, and added that local taxing authorities should assess only on productive acreage. No recommendation for state taxation was made.

"There is no necessity at this time of enacting laws regulating proration, economic conservation and ratable taking," the committee said. "It is the belief of this committee that such laws would be more harmful than beneficial." Establishment of refineries in the state would be deterred by such legislation, it was said, as they would not have "reasonable assurance" that they could purchase sufficient crude to operate at full capacity.

"Until such time as the need of state regulation is more evident, it is within the power of producers and pipe line companies to impose proration by voluntary agreement," the committee said, pointing out that some pipe line companies were already prorating wells producing more than 20 and 50 barrels a day.

The six recommendations for legislation, bills on all which had previously been introduced in the legislature, are:

1. A law requiring oil producers and operators to make and file reports with the geological survey division and the mines and minerals department showing the character and depth of formations penetrated in the drilling of oil wells.

2. An amendment to the present law relating to the plugging of dry or abandoned wells, replacing present regulations set up before the advent of modern drilling practices.

3. A law requiring the drilling of offset wells for the purpose of preventing inequitable conditions among adjoining leaseholds and royalty owners.

4. Amendment of the mechanics lien law to provide liens for work performed and materials furnished in the drilling, production and shooting of oil wells.

5. A law providing that meters be placed upon pipe lines to register the amount of oil taken from a well, with reports to be filed with the royalty owners of the amount of oil produced and taken by pipe line companies.

6. A law requiring garages, filling stations and other retail outlets of oil and gas to display prominently a placard stating that it sells, or does not

sell, Illinois petroleum and by-products of Illinois crude oil and stating the percentage of Illinois crude oil, if any, included in the commodity.

The report was characterized by Clarence T. Smith, Flora, officer of the Petroleum Association of Illinois, as presenting "definite encouragement to independent operators, refiners and crude oil purchasers to extend and enlarge their operations, and is an open invitation to outside independent operators, refiners and purchasers to enter the Illinois fields, thereby assuring further exploration and development of known fields and also many new areas."

Sadler recommends Texas open up its wells

Texas Railroad Commissioner Jerry Sadler, in a prepared statement issued last week, recommended that Texas throw open its wells at the end of two months unless other states and major oil companies joined in restricting production. He declared that Texas had done more than its share and must act to save itself.

"The Texas Railroad Commission has received definite information that an over supply of oil is piled up at the Texas seaboard, most of this crude stock coming from Louisiana and shipped into this state for the most part by major oil companies. In addition, oil is coming into East Texas from Illinois, which situation discriminates against Texas producers," Sadler said.

"The principal feature of this extraordinary condition is that continuation is certain to bring about chaos in the Texas oil industry, which the commission has for a long time been seeking to avoid for the benefit of the whole. While some oil-producing states prorate and some do not, none of them carry out the proration laws to the extent that Texas does, so the time for a showdown must not be put off much longer. Texas should not continue to hold the bag much longer.

"We have prorated and have had Saturday and Sunday shutdowns. We have done everything to protect the industry that the law permits. The major companies should feel it incumbent upon themselves, after receiving such excellent cooperation from the Texas commission, to ask the Louisiana authorities to reduce their allowables appreciably.

"I recommend that the Texas commission, for a period of 60 days continue to fit production to market demands, reducing allowables where justified, but at the end of that 60-day period unless Louisiana or any other state involved, does not effectively and promptly cut their allowables and observe the proration laws so as to stop piling up of oil from other states in Texas, then the Texas Railroad Commission should issue an order for wide-open production for all fields. Then, perhaps, we can obtain cooperation from other states, including Louisiana, and from the major companies."

Whether such a move might have the effect of promoting federal control of the oil industry was a question which was asked by Austin observers. They recognized the power of commission to take such action, but still doubted the advisability of such a plan.

It seemed certain that such a move would mean a price cut, which in turn would ruin many small independent producers in Texas as well as in the other states which might be affected. On the day before Sadler issued his statement a committee of the Illinois legislature recommended against enactment of proration laws, and found that there was no excessive production of oil in the United States.

The Sadler statement may have been issued in the form of a trial balloon, or a threat to major companies which produce in Texas, as well as Illinois and Louisiana. Sadler may be convinced that if these companies desired restricted production in the newer oil producing states, they would be able to promote this program since they have been so successful in Kansas, Oklahoma and Texas.

Undoubtedly the statement will have an important bearing on the type of evidence to be offered at the state-wide oil proration hearing to be held in June. This will precede by about a month the Interstate Oil Compact Commission meeting which is now planned for mid-July. Sadler has condemned the compact as futile even while his colleague, Commissioner Ernest Thompson (compact chairman), has been busily engaged in attempting to bring other states into the group.

California bill would give present board legal status

Another oil production control bill designed to give legal status to the present voluntary control program adopted by the industry and extend it to all producers, was introduced in the California legislature by Senator J. I. Wagy of Bakersfield.

The bill would designate the present voluntary control board of 28 members a state board and make quotas set by it enforceable as state law. Vacancies on the board would be filled by the governor until 1941, when Wagy anticipates the legislature will again take up the question of production control.

Wagy plans to hold a hearing on the measure before the oil industries committee, of which he is chairman. Opposed to the control bill of Assemblyman Maurice Atkinson of Long Beach, Wagy said he had hoped it could be amended to meet objections and so had delayed offering his own measure. However, as the Atkinson bill was sent back to committee for further amendment Wagy said he feared the measure might be blocked in the crush of legislation awaiting action before adjournment.

The Atkinson Control Bill was approved by the oil industries committee of the state assembly. The bill now goes to the assembly on consideration and if passed by that body will be sent to the oil industries committee of the senate before consideration by that group as a whole.

Proponents and opponents of the measure were heard March 21, 22 and April 4. The arguments of the proponents generally were that oil should be conserved; that voluntary curtailtailment was unsuccessful in conserving oil; that a condition of overproduction now exists; and that the particular bill under consideration would preserve the equities as between all types of producers.

Opponents on the other hand stated that voluntary control is successful, claiming that such control in California has been more successful than state control in other states; that state control of production would be monopolistic in tendency; that the independent producer would be "frozen out"; that the independent refiner would find his source of supply cut off; and that small operators, particularly those whose production from individual wells is low, would be placed at a distinct disadvantage.

The bill was submitted in January as a labor measure by the oil workers union at Long Beach. Representative of the Navy Department and the Department of the Interior, however, appeared before the state assembly committee and urged its passage. Responsible men in the oil industry appeared both for and against the measure and are believed to have contributed most of the amendments designed to make the bill workable.

Originally the bill provided for administration of the oil industry by a commission headed by the governor, or his appointee, and three appointed officials. Provision was made to prevent making any order which would cause the premature abandonment of small settled wells, or wells producing large quantities of water. Proration of production on the cubical content theory of underground oil pools also is expressly prohibited.

Michigan topping plant

Mt. Pleasant, Mich.—Glen F. Caldwell of Mt. Pleasant, head of the newly organized Glenco Refining Company, announced that construction would be started this month on a 1000-barrel topping plant refinery at Bloomingdale, Michigan.

Michigan conservation board members named

Personnel of the six-man advisory board under the new Michigan oil conservation law was announced last week by P. J. Hoffmaster, who as director of the Michigan Conservation Department, automatically became the supervisor of wells under the new law.

Appointments were as follows:

Independent operators—Harold M. McClure of Alma, president of the Oil and Gas Association of Michigan, and head of Rex Oil & Gas Company, 3-year term; C. A. Smith, Jr., of Saginaw, president Smith Petroleum Company, 2 years; Russell Furbee of Mt. Pleasant, vice president Gordon Oil Company, 1 year.

Interstate (major) company representatives—W. P. Clarke of Saginaw, resident manager of Gulf Refining Company, 3 years; E. F. Clagett of Saginaw, resident manager The Pure Oil Company, 2 years; and Kurt H. deCousser of Lansing, resident manager of Socony-Vacuum Oil Company, 1 year.

The new oil conservation act provides that the supervisor shall first consult and discuss programs with the board before issuing orders except in emergency, when he may issue an order of a maximum duration of 21 days.

Oil at the Capitols

House to hold hearings on proposed law to divorce marketing . . . Senate considers alcohol blending . . . President in favor of navy getting off-shore oil.

House to hold hearing on marketing divorce

Hearings on legislation requiring the divorcement of marketing from other branches of the oil industry will be held by a House Judiciary subcommittee May 24, it has been announced.

The subcommittee will be headed by Representative Arthur D. Healey (Dem., Mass.) and will consist of Representatives Sam Hobbs (Ala.); David Satterfield (Va.), Democrats; and Clarence Hancock (N. Y.) and Raymond S. Springer (Ind.), Republicans.

The hearings will be concerned with the bill introduced by Representative Vincent H. Harrington (Dem., Iowa) to make it unlawful for any person, directly or indirectly, to be engaged in the marketing of refined petroleum products while also engaged in one or more of the other three branches of the industry. Violations of the act would be punishable by fines of not exceeding $10,000.

Similar legislation was before Congress last session in the bill introduced by Senator Guy M. Gillette (Dem., Iowa), and was the subject of hearings before the Senate Judiciary Committee, which, however, took no action on the ground that the constitutionality of such a measure was doubtful.

Roosevelt in favor of off-shore oil confiscations

Efforts of the navy department to obtain possession of the California offshore oil fields have the full support of President Roosevelt, it was disclosed this week with publication of hearings before the House appropriations committee on the Department of Justice appropriation bill for the coming fiscal year.

Interest of the president in the matter was divulged by Attorney General Frank Murphy, appearing before the committee for a general discussion of departmental affairs, when asked about the California situation by Representative Albert E. Carter (Republican, California).

"I do not know just how it arose, or whether its origin was in the navy department or not, but that question is up and I have had a conference with the president about it," the attorney general said.

"He has expressed his views to me and I have done some work on it myself. I asked the solicitor general's office to make a study of it, and to express some opinion, which I believe would not be unsound, as to what we ought to do. I think we ought to have legislation that will support or enable any president, or chief executive, to protect the rights of the United States in those properties; because I am sure that within the next 50 or 100 years we will find that our present understanding about that, or of the law about it, is inadequate."

At the same time, Murphy admitted that he could not quote any authority for the assertion of federal rights to the off-shore lands because "there are some jurisdictional differences between the states and the federal government as to the three-mile law." Federal jurisdiction, he added, should go beyond the three-mile limit because "there is likely to be discovered great mineral deposits as well as other property of great value."

Rights of the states, the attorney general emphasized, should not be disturbed, but the rights of the federal government must be protected; all of the disputes, he said, will not be between the United States and California.

Senate committee gets alcohol blending bill

Although enactment of the measure is not expected this year, a special subcommittee has been created by the Senate Finance Committee to study the bill introduced by Senator Guy M. Gillette (Dem., Iowa) to require the blending of 7 percent of domestic alcohol with motor fuels and to consider the proposal of Senator Chandler Gurney (Rep., S. Dak.) to amend the bill to require a 10-percent blend.

The subcommittee, to be headed by Senator Bennett C. Clark (Dem., Mo.), will consist of Senators Tom Connally (Texas), Clyde L. Herring (Iowa), and George L. Radcliffe (Md.), Democrats; Robert M. LaFollette, Jr., (Wis.), Progressive, and Arthur Capper (Kans.), Republican.

This is the first time proposals for the compulsory use of alcohol in gasoline have ever been referred to a special subcommittee for consideration, although bills on the subject have been pending in Congress for a number of years.

Illinois commission approves production tax

The Illinois tax commission last week approved a proposal submitted by Marion and Fayette County authorities calling for assessing producing oil wells on the basis of their average daily production. The plan, meeting with favor of Illinois producers and lease holders, differs radically with that suggested several months ago by Lieut. Gov. John Stelle that local taxing authorities extend the tax to undeveloped leaseholds, a move which he described as one that would encourage development.

The plan offered by the two counties, and which thus far applies only to the two counties, calls for assessing wells one year old or younger at $100 a barrel of their daily average production, with two year wells assessed at $200 a barrel, three year wells at $300 a barrel, and four year or older wells at $400 a barrel.

With the township rates varying and resulting in total tax rates between $3 and $5.50, a two-year-old well with an average daily production of 200 barrels would be assessed at $40,000 and taxed between $120 and $220, depending upon its location.

Texas can legally enact graduated oil taxes

Graduated oil taxes can be legally enacted under provisions of the Texas constitution, according to an opinion rendered last week by Attorney General Gerald C. Mann. The opinion was prepared in reply to a request from Representative H. T. Brown, chairman of the House education committee, where a bill is pending providing a graduated tax with a maximum of four cents per barrel.

The bill would levy a tax of four cents on oil from wells producing more than 20 barrels daily. The rate would be 3½ cents on oil from wells producing between 10 and 20 barrels per day, 3 cents per barrel on oil from wells producing between 5 and 10 barrels daily, and 2¾ cents on oil from wells producing less than 5 barrels.

"The only possible constitutional question that we can see in the article submitted," Mann said, "is whether or not the charging of this tax in different amounts per barrel, depending on the size of the well, is based upon a reasonable classification.

"We believe that the courts of this state would hold that this new act sets up a reasonable classification, and that it is clearly valid and constitutional.

"We feel that there is a valid justification in the legislature levying a higher tax per barrel on the production of oil from large producing wells than on the production of oil from small producing wells. In most cases it costs less per barrel to produce oil from the large 'producers' than it does from the small 'producers.'

"Another difference is found in the actual operation of large 'producers' and small 'producers.' In the case of large 'producers' a greater percent of the wells are 'flowing wells' than in the case of the small 'producers'; and consequently there is a difference in the operation of the wells."

This opinion may be of unusual significance because the Texas legislature has been called upon to provide vast sums for old age pensions and has not yet passed a tax bill. The House has repeatedly refused to pass a sales tax, but did pass a general tax bill providing for an increase in the oil tax.

However, opponents of this bill protested that it would not raise sufficient funds. Inclusion of the graduated oil tax would increase the revenue from that source by 30 to 50 percent, and might offer the solution for which sales tax opponents have searched.

Market Situation

Outlook improves due to high consumption and lower crude output . . . Harry Sinclair says products price must go up or else crude price must be cut

Oil markets remain firm with prices unchanged

The market situation has remained generally favorable, recent gains in wholesale gasoline prices having been held, and the crude oil markets having been bolstered by the better gasoline picture.

The current operations of the industry, in the oil fields and at the refineries, are geared high, but the markets are fairly well absorbing the output of crude and refined products, as demand has been proving particularly good.

Current Operations

For the first half of May crude oil production figures have reflected the Saturday shutdowns of Texas fields, but sharply higher output is due in the latter half of the month because of the scheduled resumption of Saturday production in Texas.

Refinery runs of crude oil have continued large, having risen almost back to the peak of this year, and gasoline production has been correspondingly high.

But consumption of gasoline also has been large, and the industry has been able to make substantial withdrawals from storage in addition to disposing of the current production of the refineries.

Gasoline Demand Good

Although gasoline prices last week were the same as the week before at most refineries in the Mid-Continent, the markets continued to show strength. Supplies of all grades were closely held by refiners, and some plant owners still were buying to supplement their own production.

No important changes were shown, meanwhile, by the markets for kerosene and fuel oils. The stocks of those products are moderate. Supplies of both the light and heavy fuel oils are somewhat smaller than at this time last year, whereas demand is better.

Sinclair says crude oil prices are in danger

At the annual meeting of stockholders of Consolidated Oil Corporation in New York May 18, H. F. Sinclair, chairman of the company, warned that the prevailing crude oil prices were in danger.

"Either one of two things must happen," he declared. "The price of finished products must go up or the price of the raw material must go down. I do not believe that this industry can continue to buy its raw material and sell finished products as a loss.

"I am in hopes of, and we in this company are working for, a level for finished commodities that will make it unnecessary to reduce the price of crude. But I must say that if we cannot find a way to increase the price or realize a very small additional margin for finished commodities, there must be a cut in the price of crude. I want to go on record as saying that."

Sinclair added, however, that he would not welcome a reduced price for crude.

Markets consolidating recent gains in prices

Prices in the oil industry last week were generally unchanged from the previous week, apparently consolidating the gains that had been made in the recent past.

Tank car prices of gasoline did not show any further improvement. Dealer tank wagon and retail prices made slight gains, but the improvement so far has not been in proportion to the advances at the refineries.

Crude oil prices have not been altered, but the crude markets have been bolstered by the improvement of wholesale gasoline prices.

Gasoline Prices

U. S. motor gasoline ranged in the Oklahoma market last week about as follows: 62 octane and below, 4⅛ to 4⅜ cents a gallon; 63 to 66 octane, 4⅜ to 4⅝ cents; 67 to 69 octane, 4⅝ to 4⅞ cents; 70 to 72 octane, 4⅞ to 5⅛ cents.

Corresponding prices in the Chicago market were: 3⅞ to 4⅜ cents, 4⅛ to 4½ cents, 4¼ to 4¾ cents, and 4½ to 5⅛ cents.

In East Texas, 60-62, 400 end point gasoline was priced generally at 4¼ cents a gallon.

Natural gasoline, grade 26-70, was selling in the Mid-Continent markets, f.o.b. refineries, at 2½ cents a gallon, and sales were reported at the same price f.o.b. Breckenridge, Texas.

Kerosene prices f.o.b. Oklahoma refineries ranged from 3⅞ to 4¼ cents a gallon for the 41-43 water white grade, and from 4 to 4⅝ cents for the 42-44 water white grade; and corresponding prices in the Chicago market were 3½ to 4⅛ cents and 3⅝ to 4⅜ cents.

Prices of light fuel oils were generally unchanged last week. In the Chicago market range oil was priced from 3⅜ to 4 cents a gallon. The No. 1 white oil was priced from 3¼ to 3⅞ cents, and No. 1 straw from 3¼ to 3½ cents. No. 2 straw was 3⅛ to 3½ cents. No. 3 oil was 2⅞ to 3⅛ cents. No. 5 oils were 57½ to 70 cents a barrel. The No. 6 oil was quoted at 35 to 45 cents.

Illinois market survey advocated

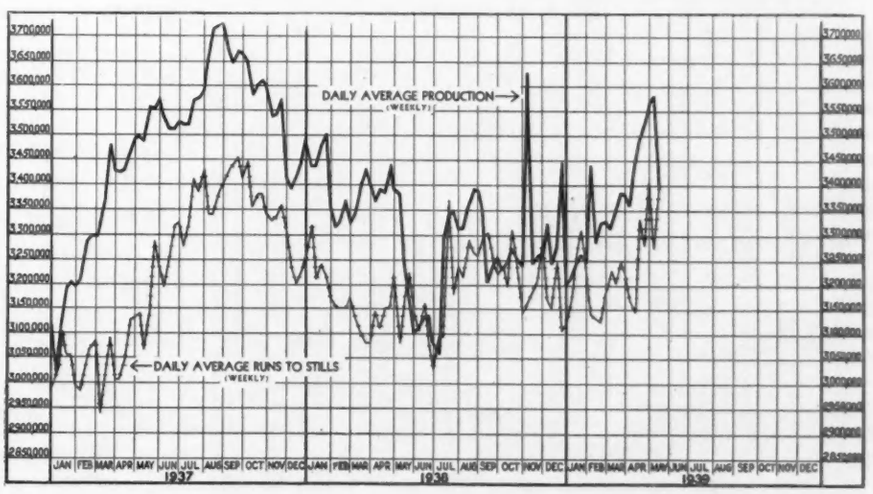
In an analysis of the market for the growing production of Illinois crude, Walter H. Voskuil, mineral economist of the state geological survey, last week warned that solution of the problem does not lie in erection of additional refineries and construction of new pipe lines unless markets can be found for the refined products or for crude oil at the proposed line terminals.

Voskuil advocated a survey of the potential supply of crude oil in the states and the market for both refined products and crude to proceed construction of new refineries or new trunk pipe line facilities.

"The prospect in Illinois is one of sustained production for several years," he said. "The short time prospect is one of an increase above current levels," he added, pointing out that, in addition to the present estimate of 350,000,000 barrels of reserves from presently proved areas, further discoveries both in new areas and in deeper horizons of proved areas are possible.

"As a consequence of an expected period of sustained production from Illinois fields, a readjustment of pres-

United States Crude Oil Production and Refinery Runs



ent channels of crude flow from Mid-Continent producing districts to refineries in the central refining district will become necessary," Voskuil declared. "The principal Mid-Continent oil producing states that will be affected are Oklahoma and Kansas and, to a lesser degree, New Mexico. While ample pipe line and refinery capacity is available in the central refining district to handle Illinois production, to do so would necessitate displacement of this quantity of oil from the Mid-Continent fields, which would require the cooperation of the refining companies."

A market of about 440,000 barrels of crude oil daily is presented by refineries of the central district, while refineries located in Illinois and Ohio are presently served by pipe lines in which Illinois crude is being shipped. Illinois refineries have a total operating capacity of 136,410 barrels daily, and at least four of them with a total capacity of 58,500 barrels are taking part of their needs from the new Illinois pools.

Eola crude contracted to British buyer

Fortified with a contract to deliver approximately 1,000,000 barrels of crude to a British refining group, Sid W. Richardson of Fort Worth, discoverer of the Eola field, Avoyelles Parish, completed a field gathering system and a short pipe line outlet late last week. Richardson negotiated the foreign contract through the Hercules Oil Company, Dallas, and will use the facilities of the Standard Oil Company of Louisiana, in loading oil into tankers at Baton Rouge.

Richardson built a 4-mile 6-inch line from his field station and 55,000-barrel storage tank on the Haas discovery well site, Section 7, to the east side of the town of Bunkie, where deliveries will be made to Standard Oil Company of Louisiana's trunk line. The latter is erecting two 55,000-barrel steel tanks at its Bunkie station in order to batch Eola crude through in 100,000-barrel lots. Richardson's pipe line system has two pumping units, with a maximum capacity of 12,000 barrels daily.

All operators at Eola are to be given an opportunity to share in the foreign crude contract by Richardson, who has announced that the price involved is $1.20 f.o.b. tanker. Participants must absorb a field gathering charge of 5 cents; 9½-cent pipe line tariff from Bunkie to Baton Rouge, and 1½ cents per barrel for tanker loading.

Richardson has indicated that he plans to restrict his production to 300 barrels daily per well, using 20-acre spacing.

Markets are absorbing large output of oils

Latest weekly statistics of the oil industry, covering the week ended May 13, showed a sharp curtailment of crude oil production but a stepping up of crude runs to refinery stills and an increase in gasoline production. Nevertheless, gasoline stocks were reduced nearly 1½ million barrels, as consumption continued exceptionally large. Stocks of both the light and heavy fuel oils also were reduced.

United States crude oil production came down to 3,402,500 barrels daily from 3,580,900 the week before, a decline of 178,400 barrels, as one of the two Saturday shut-downs for May in Texas was reflected. The national crude output was 1.2 percent larger, nevertheless, than in the corresponding week last year.

Refinery Runs Up

Crude runs to stills averaged 3,400,000 barrels daily in the week ended May 13, having been increased sharply from the 3,275,000-barrel average of the week before. At the new rate, the runs were within 5000 barrels of the 1939 peak, reached in the week ended April 29. They were 7.3 percent larger than in the similar period last year.

Gasoline Situation

Gasoline production rose to 11,172,000 barrels in the week of May 13 from 10,732,000 barrels the week before, an increase of 440,000 barrels for the week or 63,000 barrels daily, the new output having been at the average rate of 1,596,000 barrels daily.

Despite that increase in gasoline production, however, the market absorbed all the current output plus 1,408,000 barrels of storage gasoline, the total stocks of finished and unfinished gasoline in the United States having declined from 86,216,000 to 84,808,000 barrels in the week ended May 13. At the latter level, the stocks were 4.3 percent smaller than on the comparable date last year. This margin under last year's inventory is encouraging, particularly as gasoline demand is running about 6 percent higher this year than last year. However, the gasoline inventory last spring was seriously excessive.

Fuel Oil Stocks

Stocks of gas oil and distillate fuels, used primarily for heating, were reduced from 26,167,000 to 25,993,000 barrels in the week ended May 13. The stocks of these oils are around a million barrels lower than at this time last year, although comparable figures for a year ago are not available.

The storage of residual fuel oils, used by industry as fuel, came down from 108,597,000 to 108,513,000 barrels in the week ended May 13. This inventory is apparently about 2,000,000 barrels smaller than that held at this time last year, but a comparable figure is not available.

Crude Stocks at Peak

Stocks of crude oil in the United States further increased from 278,440,000 to 278,607,000 barrels in the week ended May 6, latest period for which data are available. The new figure represented a peak for this year. Since late March, crude stocks have increased about 4,500,000 barrels, despite larger than justified runs of crude through refinery stills, indicating that crude production during April was materially larger than market demand.

Trends of United States Production and Stocks

Figures are from American Petroleum Institute weekly reports, except those on crude stocks, which are from Bureau of Mines weekly reports

	Crude Oil Production (Barrels Daily)	Crude Runs to Stills (Barrels Daily)	Crude Oil Stocks (Barrels)	Gasoline Stocks (Barrels)	FUEL OIL STOCKS	
					Gas Oil & Dist. Fuels	Residual Fuel Oil
August 28, 1937	**3,731,450	3,425,000	309,506,000	66,997,000	112,111,000	
September 25, 1937	3,666,300	**3,455,000	307,974,000	65,620,000	116,472,000	
March 19, 1938	3,433,550	3,080,000	306,380,000	**93,192,000	122,067,000	
March 26	3,405,600	3,080,000	307,557,000	92,858,000	122,969,000	
April 30	3,396,150	3,215,000	307,147,000	91,339,000	21,480,000	106,790,000
May 28	3,098,650	3,150,000	301,583,000	87,946,000	23,619,000	110,696,000
June 25	3,083,900	3,025,000	293,463,000	82,412,000	25,343,000	112,458,000
July 30	3,316,400	3,240,000	288,514,000	76,864,000	27,573,000	116,721,000
August 27	3,388,500	3,255,000	285,029,000	71,754,000	29,747,000	117,179,000
September 24	3,251,150	3,220,000	280,278,000	68,605,000	31,183,000	119,285,000
October 1	3,231,800	3,235,000	280,852,000	68,602,000	31,614,000	120,145,000
October 29	3,237,500	3,145,000	275,824,000	67,590,000	33,690,000	120,029,000
November 12	3,243,250	3,180,000	273,394,000	67,551,000	34,175,000	120,491,000
November 26	3,260,900	3,295,000	270,563,000	68,628,000	33,749,000	119,885,000
December 10	3,245,100	3,150,000	§269,509,000	68,587,000	32,068,000	118,711,000
December 31	3,201,450	3,115,000	273,024,000	71,695,000	29,082,000	115,741,000
January 28, 1939	3,248,250	3,235,000	271,763,000	77,279,000	26,583,000	112,766,000
February 25	3,328,850	3,185,000	271,758,000	84,597,000	23,419,000	110,252,000
March 4	3,314,850	3,230,000	272,971,000	85,379,000	22,449,000	109,481,000
March 25	3,382,350	3,225,000	273,915,000	87,561,000	21,487,000	107,551,000
April 1	3,358,200	3,170,000	276,119,000	87,277,000	20,802,000	107,091,000
April 22	3,526,700	3,280,000	277,156,000	*87,769,000	21,058,000	105,035,000
April 29	3,568,200	*3,405,000	278,440,000	86,794,000	†25,844,000	†108,409,000
May 6	*3,580,900	3,275,000	*278,607,000	86,216,000	26,167,000	108,597,000
May 13, 1939	3,402,500	3,400,000	.....	84,808,000	25,993,000	108,513,000
May 14, 1938	3,362,200	3,170,000	‡305,748,000	88,647,000	†22,274,000	†107,967,000
Change in past year	+1.2%	+7.3%	—8.9%	—4.3%†	+16.7%†	+0.5%†

** All time peak. * Peak for 1939. § Lowest for 17 years. ‡ Stocks, May 7, 1938.
† Prior to week ended April 29, 1939, figures did not include stocks at terminals, in transit, etc., except in California. Such stocks, outside California, included for first time in week of April 29, 1939, consisted of 4,772,000 barrels of gas oil and distillates and 2,769,000 barrels of residual fuel oil.

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BAASH-ROSS BLOWOUT PREVENTER

Crude Production

Drop of 156,720 barrels daily brings United States output well below federal bureau's recommendation

UNITED STATES production of crude oil fell away sharply during the week ended May 20. High output levels of the previous spring weeks were far above the daily average of 3,402,425 barrels produced last week, and the previous week's average was 156,720 barrels daily over that for the latest period. Bureau of Mines estimate of demand for domestic crude was 22,775 barrels daily higher than actual production as the 5-day production week in Texas had its first full reflection in production figures.

Texas lifted 1,279,000 barrels daily; the decrease of 132,200 barrels resulting from the second, and last, Saturday shutdown of the month. Bureau recommendation was 127,000 barrels over output, which reached its lowest level this spring.

California registered a 3600-barrel increase over the preceding week in producing 625,500 barrels daily. Oil Producers Committee recommendation was for 50,000 barrels less, and federal estimate for 42,900 barrels less than output.

Oklahoma production at 436,250 barrels daily was 16,905 barrels below that of the week prior and 19,550 barrels below bureau prediction. Allowable was over-run by 8250 barrels.

Louisiana lifted 267,325 barrels daily, 3075 barrels less than the week before. State allocation was over-run by 3691 barrels, and federal estimate by 6325 barrels.

Illinois new pools showed a smaller production spurt than usual, producing 205,100 barrels to bring the state total to 213,400 barrels, only 2400 barrels more than in the week previous. Bureau estimate was 53,700 barrels under output.

Kansas yield waned slightly to 175,550 barrels, only 690 barrels below the previous week's high for the year and 5200 barrels over state allowable. Federal forecast for the state was 23,550 barrels beneath output.

The smaller producing areas, with the exception of Michigan and Indiana, held production below the level of the week prior.

California will benefit from needs of U. S. fleet

The return of the fleet to the Pacific Coast means local concerns will furnish a large part of the 8,250,000 barrels of fuel oil allotted the United States fleet during its 1940 fiscal year. San Pedro will be the chief source of supply. In addition this port will also supply most of the 1,801,000 gallons of gasoline and 188,100 barrels of Diesel oil to be used during this time.

Based on its present year's average cost of 64.5 cents per barrel at San Pedro, the navy hopes to get its next year's oil here at an average of 71.6 cents per barrel. A survey indicates that contract average will be but little higher than this year, or about 68 cents per barrel.

Pennsylvania Grade meeting place changed to Pittsburgh

The place for the annual meeting of the Pennsylvania Grade Crude Oil Association next month was changed from Hershey, Pa., to Pittsburgh, at a meeting of the organization's board of directors this week. The dates for the convention are unchanged, June 15 and 16.

Change in meeting place was made for the convenience of the greater number of members of the association.

Directors to serve for the ensuing year will be elected at a business meeting to be held at the close of the convention proper. The board consists of 30 oil men, representing production and refining interests in the Pennsylvania oil industry.

United States Crude Oil Production

Estimates Compiled by THE OIL WEEKLY

DISTRICT OR STATE	Bureau of Mines Estimate of Daily Demand (May)	State Allowable in (May)	BARRELS DAILY FOR WEEK ENDED May 20	BARRELS DAILY FOR WEEK ENDED May 13
TEXAS—				
Texas Panhandle	.....	.....	66,250	83,550
North Texas	.....	.....	81,450	78,550
West Central Texas	.....	.....	30,750	29,600
West Texas	.....	.....	199,550	221,000
East Central Texas	.....	.....	90,050	101,500
East Texas Field	.....	.....	375,450	429,000
South Texas	.....	.....	230,350	243,000
Texas Gulf Coast	.....	.....	205,150	225,000
Total Texas	1,406,100	1,393,077*	1,279,000	1,411,200
CALIFORNIA—				
Long Beach	.....	.....	48,028	48,500
Santa Fe Springs	.....	.....	28,302	27,200
Huntington Beach	.....	.....	31,589	31,300
Dominguez	.....	.....	21,117	22,100
Ventura Avenue	.....	.....	33,232	32,900
Midway-Sunset	.....	.....	58,665	51,100
Kettleman Hills	.....	.....	51,931	53,100
Wilmington	.....	.....	90,361	89,600
Others	.....	.....	262,275	266,100
Total Californa	582,600	575,500†	625,500	621,900
OKLAHOMA—				
Oklahoma City	.....	.....	107,400	99,050
Seminole Area	.....	.....	112,025	112,350
Fitts	.....	.....	27,025	26,000
Others	.....	.....	226,800	215,755
Total Oklahoma	455,800	428,000	436,250	453,155
LOUISIANA—				
North Louisiana	.....	62,629	73,325	76,150
South Louisiana	.....	201,005	194,000	194,150
Total Louisiana	261,600	263,634	267,325	270,300

DISTRICT OR STATE	Bureau of Mines Estimate of Daily Demand (May)	State Allowable in (May)	BARRELS DAILY FOR WEEK ENDED May 20	BARRELS DAILY FOR WEEK ENDED May 13
ILLINOIS—				
Salem	.....	.....	111,700	101,500
Loudon	.....	.....	44,900	50,000
Other New Pools	.....	.....	48,500	50,500
Old Pools	.....	.....	8,300	9,000
Total Illinois	159,700	.....	213,400	211,000
KANSAS—				
Burrton-Haven	.....	.....	10,275	10,100
Russell County	.....	.....	22,850	21,850
Silica	.....	.....	9,975	10,600
Others	.....	.....	132,450	133,690
Total Kansas	152,600	170,350	175,550	176,240
NEW MEXICO	115,500	117,100	111,550	114,850
EASTERN STATES—				
Pennsylvania Grade	.....	.....	76,750	70,950
Others, Eastern	.....	.....	5,500	16,350
Total Eastern States	.....	.....	82,200	87,300
MOUNTAIN STATES—				
Wyoming	64,200	.....	58,150	58,950
Montana	16,100	.....	14,300	14,750
Colorado	5,200	.....	3,550	3,650
Total Mountain States	85,500	.....	76,000	77,350
MICHIGAN	50,000	.....	63,550	63,000
ARKANSAS	52,900	54,672	55,200	54,150
KENTUCKY	15,800	.....	14,500	16,600
INDIANA	2,900	.....	2,400	2,100
Total United States	3,425,200	.....	3,402,425	3,559,145

* Daily average considering 2 Saturday and 4 Sunday shutdowns, water exemptions, and exemption at Rodessa.
† Recommendation of Central Committee of California Oil Producers.

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A. P. I. Meeting

Number of important technological advancements are disclosd at the Ninth Mid-Year Sessions, which also reviews economics and public relations.

The ninth mid-year meeting of the American Petroleum Institute, held in New Orleans last week, revolved largely around its technical program. The engineering sessions, and numerous committee meetings, brought forth many new avenues of progress that have been achieved within the industry. Practices, products and problems unknown just a few years ago were discussed by speakers that had made exhaustive studies. The outstanding accomplishments attained in many instances prophesized greater efficiency in the discovery of producing structures, faster and more economical drilling practices of high caliber, and highly improved completion and production techniques. And, at the same time, they indicated that there was much future work needed to solve and advance a great many engineering problems.

However, with the industry facing so many economic difficulties, these phases also came in for some consideration.

Byles Discusses Situation

"From the present outlook, gasoline consumption may be up about five percent," in the opinion of Axtell J. Byles, president of the institute. However, at the time he pointed out that while the industry may sell more gasoline this summer, there is a question whether refiners and service stations will get a commensurate price.

"I am more afraid that some commodity will be developed to replace oil as a motor fuel, than I am that there will be an early exhaustion of the United States petroleum supply," was the reply of Byles, during an interview with the press, to a question regarding exhaustion of petroleum reserves. "Last year," he continued, "we discovered considerably more oil than we produced, and this accomplishment, despite the warnings of the prophets of disaster, is not unusual. The situation now looks as if, for many years, we will be troubled more by the difficulties of handling a surplus of oil than by shortages."

Adequate Wartime Oil Supply

The United States is the only country in the world with an adequate wartime supply of petroleum products and services, it was said by W. R. Boyd, Jr., executive vice president of the American Petroleum Institute during the course of the meeting. "The United States also is the only country with really adequate facilities for refining crude oil on a wartime scale, and is the only one with really adequate facilities for distribution.

"If the nation should be forced into armed conflict, the industry is far better prepared to serve the cause of national defense than it was in 1917. Today the petroleum industry has nearly twice the number of producing oil wells," he explained. "It has four times the annual production of crude oil and twice as many refineries as in 1917. Annual gasoline output of refineries is eight times that of 1917. Lubricating oil production facilities and output have doubled. Fuel oil output is three times that of the World War period. Under wartime emergency conditions, output both of fields and refineries could be increased vastly, and almost overnight. Furthermore, we have twice as much crude oil in reserve to draw upon."

Boyd pointed out that improvements in refining processes enable twice the quantity of refined products to be obtained from each barrel of oil than obtained in 1917, and that motor fuel produced today is of higher quality, and is productive of more power than ever before. "The American petroleum industry," he continued, "also has given this country the only adequate supply of 100-octane fighting-grade aviation gasoline in the whole world. Since modern warfare is conducted in the air, availability of gasoline must be a decisive factor. Our industry makes it possible for more planes to remain in the air for longer periods than can those of any other nation—on the basis of availability and quality of aviation fuel."

One General Session

One general session, a departure for a mid-year meeting, was held during the convention, and the remainder of the program was divided into committee meetings and division group sessions.

The one general session heard Chester H. Gray, of the National Highway Users Conference, Washington, D. C., give the warning that highway needs and costs may increase in the future, and that because the highway tax burden is borne by the individual users, who are in the low-income bracket, the economic phase is important. He urged "reasonable costs, reasonable regulations, and reasonable expansion of the highway era into future years."

"The people who pay the freight must wake up in their own financial behalf and see to it that for the next decade our highways be built and maintained on statewide and nationwide plans so as to keep original costs and maintenance expenses at a minimum."

Future Discovery Rates

Future prospects for United States reserves and discovery rates were injected into the picture by E. DeGolyer, Louisiana Land & Exploration Company, Dallas, whose prepared paper was read at the general session by W. R. Boyd, Jr.

He declared himself not an alarmist and that he did not expect to live long enough to see the arrival of that oft predicted day of oil shortage, but that "Whatever the amount of oil in the United States may be, our reserves are definitely limited and they are being exhausted at the rate of over one billion barrels per year. The discovery of additional oil by new techniques cannot go on indefinitely. We are in the position of a man who seines a pond for fish with nets of different mesh. Through the larger meshes certain fish may escape but finally we come to a mesh so small that nothing escapes which is worth having."

The series of different individual techniques that have been used by the industry, such as random drilling, core drilling, refraction seismograph and now the reflection seismograph, were listed by DeGolyer. Each has had its era, and has been replaced by some newer method, he said, and added that some of the many electrical methods of exploration now being experimented with, or some form of soil or soil gas analysis might meet tomorrow's needs for new prospecting technique.

DeGolyer estimated that the cost of finding oil has been cut to 10-12 cents per barrel from the 20-25-cent cost of the early 20s. He said the hazard of prospecting has been decreased considerably, but changing conditions tend to make various technique obsolete.

Another speaker at the general session was John Wright, federal vocation education director at Washington, who discussed efforts of this department to assist various industrial workers to obtain a better knowledge of the technical problems that confronted them every day.

Public Relations Studied

In a world changing more rapidly and radically than at any time in history, selfish interests are seeking to limit, hamper, and direct business in ways that best will further their aims, Milton Wright, author, of New York, warned the Institute at a session devoted to public relations.

The economic picture is one of discord that has arisen out of the clashing interests of management, labor, capital, consumers and competitors, Wright continued. "Something must be done about it," he declared. "When something is done, when industry is playing the game the way it must be played under the new rules, and when the public is in full possession of the facts, then industry and public will pull together.

Wright warned that the petroleum industry is particularly vulnerable to the "all sorts and conditions of people, fit and unfit," who seek drastic changes, because oil is essential both in peace and war, touches directly the lives of more people than any other product except food, and has always operated under the competitive system now fighting for its life.

The business executive, if he is to stay in the game, must establish and maintain good public relations, concluded Wright.

The important function of the retail dealer in a program of public relations for the petroleum industry was discussed by H. A. Inness Brown, publisher of "The Gasoline Retailer," New York.

Any program of public relations, should assign an important position to the dealer relations and dealer policies, Brown stated. "The dealer is the chief channel through which the industry finally must work if it is going to receive the maximum value in good will efforts."

The first problem, Brown said, should be the elimination of dealer misconception as to the make-up and service of the industry. The second problem is the invasion of the retail field by agitators and radical leaders who hope to upset the business structure. The third problem, he listed as having to do with the political aspect of the industry which makes itself known by investigations, legislation, and legal action by the courts.

As specific solutions, Brown proposed a fact-finding survey and a study of retail and jobber functions; the sponsoring by the industry of a public relations program within the industry, and the formation of a dealer relations board of committee organized to hear and arbitrate the complaints of dealers which are made collectively.

P. E. Lakin, Shell Oil Company, St. Louis, outlined some of the dealer relations problems. The problem, he said, revolves on two fundamentals; first, that the independent dealers constitute an outlet for a high percentage of the total gasoline gallonage sold and, second, that the dealers and their employees represent the suppliers most extensive contact with the public.

James Tenham of The Texas Company, New York, also spoke at the public relations session. His subject was "Possibilities for Public Relations in All Branches of the Industry." C. R. Dooley, of Socony-Vacuum Oil Company, New York, discussed industrial relations.

Hunter Elected Director

The American Petroleum Institute's board of directors elected J. C. Hunter, of Gregg Oil Company, Abilene, Texas, a member to fill the unexpired term of the late Amos L. Beaty, of New York. The board adopted a resolution in memoriam expressing sorrow in the death of Director Amos L. Beaty, one time president of the Institute and for years a member of the board.

Production Meetings

The Division of Production held three group sessions, one was devoted to drilling practice and materials, another to production practices, while the third was a symposium on casing weldin. Abstracts of papers presented at these sessions follow:

A Preliminary Evaluation of Factors Controlling Rate of Penetration in Rotary Drilling

By J. E. BRANTLY, and
EDGAR H. CLAYTON,
Drilling and Exploration Company

Vastly increased efficiency of personnel, methods and equipment has halved the time required to drill oil wells in American fields. During the past eight years, the increase in the rate of penetration in rotary drilling of wells has mounted 123.7 percent. Study of the drilling records of more than 500 wells indicates that increased efficiency of personnel and equipment contributed 55.5 percent, rotating speeds 39.6 percent, and volume of drilling fluid used 28.6 percent. The weight on the bit also was a contributing factor.

Despite many wells being drilled improperly in the past six years, the increase in the rate of penetration by rotary drilling equipment in some fields has amounted to nearly 400 percent.

A surprisingly definite trend of increase was noted by plotting penetration rate against rotating speeds in revolutions per minute. A table-speed increase of 33-1/3 percent (75 to 115 revolutions per minute) resulted in a 39.6 percent increase in penetration rates.

A direct relationship between rate of penetration and fluid volume increase. At 80 revolutions per minute, the rate of penetration increase between the limits of 550 and 750 gallons per minute amounted to 23 percent. At 90 revolutions the rate of increase was 25.6 percent. At 120 revolutions a minute the rate of increase was 31.6 percent. At 160 revolutions the rate of increase was 34 percent.

An analysis of the importance of weight on the bit showed that in formation approximating penetration rates of 5 to 10 feet hourly at 250 revolutions, an increase of 100 percent in weight would result in a penetration rate increase of 67 percent. In drilling through formations with approximate penetration rates of 10 to 40 feet per hour, an increase in weight of 100 percent resulted in a penetration rate increase of 55 percent. Penetration rates approximating 50 to 90 feet per hour are increased 50 percent with a weight increase of 100 percent. It was noted also that increased weight is more effective in hard formations than in soft ones.

Cement for Oil Wells: Status of Testing Methods and Summary of Properties

By W. W. ROBINSON
The Texas Company

The placement of cement in oil wells presents problems for both oil operator and cement manufacturer. Particularly in the case of deep drilling, the need for special cements has resulted in the development of new test methods for evaluative purposes.

Although these tests have contributed to the solution of cementing problems, their development and application have not been coordinated. Consequently, considerable confusion exists as to acceptable methods and apparatus for carrying on such work.

Adoption of standard test measures would elimniate much of the confusion now caused by the use of special procedures developed within the industry, and also would be helpful in providing the right types of cements in accordance with specific needs of the various drilling projects.

Recommended procedure included a sieve test to detect lumps, unground, or foreign material; a ring test to determine the amount of water necessary to make a slurry of given fluidity; thickening-time and consistometer tests to indicate how much time can be devoted to mixing and placing the cement before it thickens to the point where it cannot be pumped; tensile strength test to permit ascertaining the strength of set cement; foam test to eliminate trouble occasioned by large amounts of stabilized foam; and a thorough study of the physical properties of cement.

The methods of testing were described. It was noted, especially in the case of the methods for determining the allowable time that a cement may be pumped, that special testing equipment has been developed. As this test was considered as reflecting the most important characteristics of oil-well cement, it was stated the industry would benefit if the test and apparatus were standardized.

The desirability of formulating an American Petroleum Institute code for testing cements for use in oil wells was indicated.

Design of Casing Programs

By J. O. HILLS
General Petroleum Corporation

The importance and cost of casing programs justify careful engineering design based on the best available information on strength and loading conditions.

By design of casing programs is meant the selection of suitable casing sizes, weights, grades; type of joints; and hole sizes to be used in a particular well to perform most safely and economically the functions of water shut-off and protection at depths predetermined by geological considerations.

A method of design was outlined which considered actual conditions, and by which engineers could select proper casing for any specific well.

In the design of a casing program the first consideration is the size of pipe to be used, and this determination should start from the size and length of liner to be used. Selection of the liner size controls the size of all other strings, and this has an extremely important bearing on the total casing cost. Large liners have many advantages, and these advantages should be balanced against the comparative costs of alternative programs starting with the different liners.

Having selected tentatively the size and length of liner, the necessary hole size is determined from the required clearance.

Having determined the hole size required for setting the liner, the size of the next string of casing is chosen. This will be the smallest casing that safely will pass a bit of an A.P.I. size at least as large as the required hole. This procedure is repeated for succeeding strings, although final selection of each must wait until the maximum outside diameter of joints of the previous string has been decided in each case.

With the size of the string thus determined, the next problem is collapse; for the weight of the string, and thus its required tensile strength, cannot be determined until the collapse problem has been solved. The casing must be of sufficient strength to withstand a collapsing pressure equal to the maximum difference between the external pressure due to mud or formation fluid and the minimum internal pressure which may exist at any time during the life of the well.

After choosing the possible alternative weights and grades of pipe for collapse resistance, the choice of weights, grades, and joints for tensile strength must be made. Pipe and joint combinations giving the desired tension safety

factors must be combined with the alternatives selected from collapse considerations to give the least expensive total cost consistent with simplicity in numbers of different sizes, weights and grades.

Using minimum collapse-strength figures and assuming maximum possible pressures, very low collapse safety factors may be justified.

Clearance- and tension-correction charts and a casing program design form were presented. The charts indicated how, by ascertaining total depth, depth of water horizon, mud weights, and other data, it was possible to plot a casing program which would reveal just what casing should be used for any given well.

Selective Exclusion of Fluids from Wells

By PAUL D. TORREY
The Sloan and Zook Company

This paper, sponsored by the Southwestern District Topical Committee on Production Practice, was devoted primarily to modern methods employed in the completion of wells, and in reworking jobs when these may be necessary. It dealt largely with squeeze cementing, a process whereby a cement slurry is forced, or "squeezed" under pressure into or against a permeable formation, either in open hole or through gun perforations in the casing.

The use of the cement retainer and gun perforations of casing has increased materially the application of squeeze cementing for the reduction of high gas/oil ratios, and for the exclusion of water; and has improved the probability of success in these operations.

Breaking down the formation by water under high pressure appears to be essential for successful squeeze cementing, and such evidence as is available indicates that the water so used has no detrimental effect on a high-pressure oil sand. The application of high water pressures on the formation may cause an actual rupture along bedding planes or other lines of sedimentary weakness, thereby increasing the volume of open spaces into which the cement may be squeezed—thus providing an irregular surface for the better bonding of the cement against the formation squeezed.

It is indicated that the break-down water preferentially will go into a gas or water sand, rather than into a live oil pay, and that the cement slurry in most instances will not form a tight bond when in contact with oil.

Laboratory investigations have indicated that cement slurry will not penetrate sands having a permeability of less than 100 darcys, even under extreme pressures.

The presence of a shale break between an oil pay and a gas pay will increase greatly the probability of success in the reduction of high gas/oil ratios by squeeze cementing; and the placing of shot perforations in close proximity to the gas/oil contact, where no break exists, has been shown to be extremely important.

The application of maximum squeeze pressures of 3000 pounds per square inch or more, has given the best results in reducing high gas/oil ratios by squeeze cementing; and heavy cement-slurry weights of from 15.5 to 16 pounds per gallon appear to give the best results. The application of maximum squeeze pressures of 4000 pounds per square inch, or more, has given the best results in the exclusion of water by squeeze cementing. If water is to be excluded by plugging back to higher parts of the sand or to higher formations, this can be accomplished better by squeezing through gun perforations.

Multiple-batch jobs and the use of gel types of ceemnt have been most helpful in building up the desired maximum squeeze pressure for the exclusion of water when ordinary squeezing methods proved unsuccessful.

Gun-perforated completions permit a close control of oil production, and provide an easy means for future remedial work when work-over or plug-back jobs prove necessary.

New chemical methods are assuming considerable importance, and the gel-plugging agent has been applied successfully in hard-rock fields for the exclusion of water. The next few years may bring a remarkable development in the use of chemical methods of plugging.

Typical Dynamometer Cards and Their Application

By EUGENE HOSFORD and EMORY KEMLER
Gulf Oil Corporation

The dynamometer, as an instrument for analyzing well performance, has become a very important tool of the production engineer. The many factors which influence a dynamometer card require a highly-developed technique in the interpretation and application of the data and, in most cases, require supplementary data before a rational interpretation can be made.

Dynamometer cards reveal to the engineer much of the temperament and character of each well, and disclose its peculiar reasons for failure to perform according to expectations. Data revealed include the pressures encountered by pumping equipment, the power required for the most efficient operation, and even the power losses from friction. From such information the engineer may select and use equipment so as to assure the most productive results.

Individual instruments are available for measurement of torque loads, pressures, speeds, friction losses, and other characteristics. The dynamometer, a device of relatively recent application, combines the readings of other instruments into one measurement.

Dynamometer data have application during three phases of a well's history. The first general application is in selection of equipment. The second is to check operating conditions where equipment has been installed, to prevent trouble or improve conditions. And the third is the application of dynamometer data to troublesome wells to reduce or to eliminate the trouble.

The problem of equipment selection is not, as at first might be expected, that of rating the equipment, but the more difficult problem of rating the well.

Dynamometer cards do not limit their service to indicating the nature of the trouble. They can be used to determine if changing the speed of pumping, the length of the pumping stroke, or the substitution of heavier or lighter equipment would effect any improvement.

If trouble develops during the operation of the well, dynamometer studies offer a means of investigation that is much cheaper than trial-and-error methods. Such studies also offer a cheap and easy means of obtaining advance information on the results of changing to pumping equipment designed to produce a well at its full capacity.

Temperature Determination in the Cooling Beads of Arc Welds in Steel Casing

By W. A. BRUCE,
Carter Oil Company

Engineers interested in circumferential casing welding have known for some time that the exact knowledge of temperature distribution and cooling rates is necessary for a metallurgical understanding of this type of weld.

Because of difficulties in actually measuring temperatures, a mathematical formula has been developed that expresses the temperature at any place in the casing at any time. When given a thorough test of its ability in a number of common field-type welds, the agreement between the experimental and theoretical development indicated that considerable confidence may be placed on the equation. The formula showed a deviation from the mean of less than 6 percent in determining the thermal behavior of cooling casing welds, which was more accurate than any set of tests in which these temperatures were measured.

The Weldability of Casing Steel

By S. L. HOYT,
A. O. Smith Corporation

In welding casing in the well, the desired quality of the steel is that it will be strong and yet can be welded and then dropped quickly into the mud of the well without hardening or cracking.

Whereas one steel may weld satisfactorily with one technique, with another technique the same steel may produce a brittle weld. Thus, there is a dual problem of determining correct operating conditions for welding casing strings and selecting steels which can be welded properly under conditions which can be established in practice.

Therefore, of importance is an analysis of the fundamental metallurgical elements of the problem of weldability in an attempt to point out the parts played by the composition of casing steel, the hardening characteristics of the heat-affected zone, and the rate of cooling from above the critical range.

It has been determined that lower carbon steels are less susceptible to hardening on being cooled from above the critical temperature. Just as carbon increases the hardenability of steel, the addition of other elements acts in the same way, although to a lesser degree. Manganese has a pronounced effect on the time required to nucleate, or start, the transformation to pearlite. Other alloying elements, such as copper and molybdenum, likewise have a retarding influence on the transformation to pearlite, and hence exert a hardening effect.

It now is well recognized that the grain size of the austenite exerts a profound effect on the hardenability of steel.

A steel of not over 0.25 percent carbon, with normal amounts of manganese and other elements, will give no real trouble in arc welding. Such a steel, however, is not suitable for the stronger grades of casing, in which the carbon and manganese are increased and other elements are added. These elements affect weldability materially.

Examples have shown that variations in the rate of cooling below 1400° F. may affect materially the hardness of the steel in the affected stock. It has also been found that the time of holding, prior to quenching in the mud, may be an important and independent factor.

Critical-Temperature Ranges of Steel by the Dilatometer Method

By L. H. WINKLER,
Bethlehem Steel Company

Methods of determining critical temperature ranges of steel by use of the dilatometer indicate the relative extent of dimensional changes and stresses taking place during the cycles of heating and cooling, and point the way to ascertaining which are the weldable steels.

Curves developed during this study showed that for steels of equivalent hardness, when properly heat-treated, the transformations on cooling may take place at greatly different temperatures. In general, it can be assumed that the lower the temperature of transformation on cooling, the greater will be the tendency toward "tenderness" on cooling from a welding temperature; and if tubing is to be welded in the field, it may be desirable to consider the dilatometric curves of the steel to be welded if safe welds are to be produced.

Application of Critical Data in the Field Welding of Casing

By L. R. HODELL,
Carter Oil Company

This paper closed the welding symposium and summarized developments disclosed by Messrs. Bruce, Winkler and Hoyt and discussed application of certain material.

The dilatometer curves have indicated how very definite is the phenomenon evidenced when a steel passes through the critical temperature range. It is obvious that dilatometer curves, which indicate the critical ranges in various steels at such high rates of cooling as 20° to 50° F. per second, would be most valuable. If it becomes possible for such relationships to be established accurately, they become a very quick and direct way of getting the information necessary for those desiring to weld casing.

Hoyt has attacked this problem from a metallurgical standpoint, and his attack is helpful, and may indeed be more promising, as far as the future is concerned, than the dilatometer method of locating the critical range. Inasmuch as no one yet has worked out a method of taking dilatometer readings at fast cooling rates, it may be that there are fundamental difficulties involved, and the method may not be feasible. Hoyt's method of approach through establishment of transformation rates, however, would seem to be definitely possible; and although the work has not been done on the lower-carbon steels that we are so badly in need of, there is no apparent reason why it could not be done.

When one or both of these methods are developed further for higher cooling velocities and a wider range of steels, an important forward step will have been made in our knowledge of steels in general and admissible techniques.

Whatever the approach to the problem, the information desired is the same, viz., (1) at what temperature does transformation cease in a given steel? and, (2) what hardness results from cooling given steels through the critical-temperature range at sub-critical-cooling velocities? The necessity for this information is to know (1) when we can put the hot weld into the water; and (2) what welding techniques must be adopted in order to insure admissible cooling velocities.

Regardless of what the approach may be, Bruce's development of the temperature distribution at a circumferential casing weld is what makes possible the use of the information when it is obtained. Results of his study are the fixed point which makes possible this completely new method for devising suitable welding techniques.

Scouts Meeting

Byles stresses importance of public relations work; John Suman and E. O. Thompson dwell on situations dealing with economic vicissitudes of industry.

Oil scouts from all parts of the United States gathered in Houston May 18 to 20 for the sixteenth annual convention of the National Oil Scouts Association of America. The meeting was featured by a heavy attendance, an interesting array of talks by nationally known oil executives, extensive entertainment, and educational novelties.

John R. Suman, vice president of Humble Oil & Refining Company, Houston, talked on "Role of Scout and Land Man in Well Spacing," the address having assumed both serious and humorous aspects. He said that in the old days a scout had to be a good "super-snooper" on horseback, floundering through the mud in the arduous task of visiting wildcat wells, and when he got to town, as if he knew Morse code, he spent all his idle time sitting around the telegraph office listening and learning what the other boys were reporting. Now he rides around in a streamline automobile, stays on the paved roads most of the time, and gets his dope from check meets held in hotels. While he formerly talked of nitroglycerin shots, sand reels, bull ropes, headache posts, etc., he now discourses fluently about electric logs that show so many ohms of resistivity, about gravity anomalies, gun perforating, permeability, reservoir energy, bottom hole pressures, etc.

Need Fewer Wells

Suman stressed the importance of proper well spacing and pointed out that properties are being developed principally with borrowed capital. As long as the average oil man can borrow money, he goes blithely along, but such recent occurrences as decreased allowables and a somewhat lower posted price have caused some misapprehension to him or his financial backers, it was stated.

The 25 percent increase in production which the State of Texas has enjoyed from 1934 to 1938 has been completely outweighed by the rapid increase in the number of producing oil wells from 51,600 to 84,406 at the end of 1939. His company's statisticians forecast that if drilling continues at the rapid pace it has maintained in recent years, the daily production of the flush wells will have to be prorated downward further from the figure of 28.7 barrels per day in 1938 to 17.2 barrels by the year 1943, even in the face of an estimated 20 percent increase in the demand for Texas crude.

There is only one remedy, he added, and that is to drill fewer wells so that the older wells won't have to be constantly giving up a proportionate of their market demand to new completions. The soundest way to get fewer completions is through wider well spacing, it was stressed.

Col. E. O. Thompson, member of the Texas Railroad Commission, delivered an interesting and informal address on "Some Comments and Observations." He showed a keen knowledge of oil scouting and told the scouts of the importance of meeting the public with the proper tact and front. The oil scout who expects to forge ahead as an executive of tomorrow should familiarize himself with geology, petroleum engineering, law and economics, Thompson stressed. He humorously added that the scout could write his company for technical books that might help him to forge ahead, and while getting the books without charge might also tell the company what he was doing.

Federal Control a Danger

He stressed the dangers arising from federal control. The government, in gradually obtaining control, first asks for a few reports, then becomes firm if the reports are late, makes suggestions as to practices, and finally assumes complete control. There is no such thing as "a little" federal control, he said.

Thompson asked the scouts to use

their influence to limit drilling to a level somewhere near indicated requirements. He stated that the industry during the past few years has been drilling more wells to obtain smaller well allowables, a condition often referred to as the law of diminishing returns. Sound economics will not support a plan that calls for increased activity that can only bring a diminishing return, he said.

Sound well spacing practices will go a long way toward solving the overdrilling problem, he stated. The allowables in various Texas fields will produce all the recoverable oil, but it will require in many fields a very low well allowable and a long period of time to obtain it, he added.

Thompson said there was no danger of an oil shortage, and cited developments since 1925 to prove it. He stated that the known reserves totaled 5 billion barrels in 1925, but that since that time 12 billion barrels have been produced and the present reserve is about 17 billion barrels.

Public Relations

Axtell J. Byles, president of the American Petroleum Institute, addressed the meeting on "Public Relations." He stated that American business has accomplished remarkable results in selling its products, but has failed dismally to sell itself. The case of the petroleum industry is pertinent, it was shown. No American industry has rendered more or better service to the American people, and few are as little understood and so little appreciated. No other industries have better records of progress, but few have been subjected to more widespread criticism and have so unjustly reaped the sad rewards of public misunderstanding.

None can undertake to achieve good public relations for the petroleum industry. That is something which each corporation, company, partnership, and individual must do for himself. We have good public relations, or we lack them in direct proportion to the extent of the efforts made by the units comprising the industry, he said.

Reduced to its simplest common denominator, good public relations for industry means chiefly the observance of proper industrial etiquette, Byles stressed. The petroleum industry is a far-flung, highly competitive, diversified industry. It will take thought and patience, time and sincere effort to correct many of these situations, which to many of us are old, old stories, he concluded.

Bradford district producer group has technical session

Technical and economic problems occupied 200 members of the Bradford District, Pennsylvania Oil Producers' Association, when they held their annual meeting in Bradford May 12 and 13. It was the first meeting of its type to be held by the district organization, and indications are that it will be repeated.

O. C. Carlson, superintendent of South Penn Oil Company, told delegates that savings equivalent to 2 percent of the volume of crude can be realized by use of vapor-tight tanks and equipment with efficient oil, gas and water separators. "When we apply this percentage to the daily production of 50,000 barrels per day from the Bradford and Bolivar field, the total represents quite a large figure which, when added to the gas saved, will yield a nice profit to the producers as a whole," he said.

The speaker warned against losses encountered through use of the old type receiving tank, which in some cases he said ran as high as 5.2 percent with a year-round average of 3 percent, against losses not to exceed .8 percent on gas-tight equipment.

Discussing "Air and Gas Repressuring," R. B. Bossler, production engineer for Brundred Oil Corporation, Oil City, cited performance records at two properties, one repressured by methods in common use 10 years ago and the other by more modern methods. Considerable improvement in ultimate yield per well per day resulted with the use of closer and uniform spacing and control of input, the speaker declared.

The use of small and short gas gathering and distributing systems in repressuring operations were cited by Bossler as being highly desirable, and he mentioned horizontal drilling, electrification and intermittent application of pressure as recent developments offering promise. "If a price can be maintained at a level where secondary recovery operations are profitable, production from the lower fields can be multiplied by four or five," he added.

H. O. Murphy, Bradford Electric Company, described means of improving efficiency and decreasing power costs. He cited energy costs for pumping a single well, two wells from a single pump, and a central pumping unit in a 50-acre water-flood development. The central unit, with a cost of .011383 cents per barrel of oil, was found to be the most expensive, followed by a cost of .011339 cents for a single-well pump, and .009178 for a two-well unit.

"Problems in Water Flooding" were discussed by Dr. S. T. Yuster, head of the water flooding research laboratory at Pennsylvania State College. He detailed problems of pattern drilling, spacing, shooting, pressure, flooding water, gypsum, curtailment, back pressure and by-passing, declaring: "Some of them have been solved while others are in the process of solution. Theoretical studies which seem so impractical at first glance are finding practical applications daily and are chiefly responsible for the advances being made.

At the business session, the following officers, executive committee members and directors were named:

Officers—D. B. Tanner, president; R. S. Pringle, Jr., first vice president; Hugh Grant, Jr., second vice president; A. C. Simmons, secretary, and A. E. Booth, treasurer.

Executive Committee Members—D. T. Andrus, A. E. Booth, George Bovaird, Jr., F. D. Dorn, E. C. Emery, R. M. Haskell, W. J. Healey, Parker L. Melvin, C. N. Pfohl, Jr., R. S. Pringle, Jr., H. M. Ryder, W. J. Sloan, L. G. Smith, C. F. Stevenson, C. E. Streeter, D. B. Tanner, T. P. Thompson, Jr., and H. J. Walter.

Directors—N. V. V. F. Munson, Roy Oakes, Wilson K. Page, Cornell N. Pfohl, Jr., R. S. Pringle, Jr., George Rhodes, H. M. Ryder, A. Schorman, A. C. Simmons, G. A. Simpson, W. J. Sloan, Lynn G. Smith, C. F. Stevenson, C. E. Streeter, D. B. Tanner, T. P. Thompson, Jr., J. Blaine Walker, H. J. Walter, C. L. Wann, Neal K. Wilson, G. B. Wood, Archie L. Yerdon, D. T. Andrus, H. G. Barcroft, A. E. Booth, George Bovaird, Jr., E. H. Bryner, D. W. Daly, George H. Dana, M. L. Dana, W. N. Davis, Robert A. Digel, F. D. Dorn, E. C. Emery, Hugh Grant, Jr., R. M. Haskell, William J. Healey, H. H. Jeutter, F. H. Johnson, J. Paul Jones, Charles E. Krampf, Tom D. Mallory, Parker L. Melvin, and John Messer.

Pipe Line News

Work started on Socony-Vacuum line in Illinois

Construction work began May 15 on the western end of the Socony-Vacuum Oil Company, Inc.'s 355-mile 10-inch trunk line, which will extend from Mitchell terminal, near Wood River, Illinois, to Lima, Ohio, with a lateral to the Illinois basin oil district. Contractors on the mid-section and east unit are due to start welding pipe this week.

A representative of the company has discounted the possibility of Socony-Vacuum Oil Company diverting a portion of its future Illinois basin crude runs, which will involve oil produced and purchased by Magnolia Petroleum Company, a subsidiary, to idle storage in the Mid-Continent. Growing demand for crude at the former's refineries at Trenton, Michigan, and Buffalo, New York, will require continued shipments from the Mid-Continent in addition to the Illinois supply, according to reports.

Magnolia Petroleum Company is currently producing an average of 27,100 barrels daily from 179 wells in the Illinois basin, and has 25 field operations.

Pending completion of the 10-inch carrier, Magnolia Petroleum Company has been supplying 5000 barrels daily of Illinois crude to Standard Oil Company of Indiana in exchange for an equal volume daily supplied from the East Texas field by Stanolind Oil & Gas Company. This swap has been in effect since March 1.

Ask bids for line out of Lovington, New Mexico

Construction bids are to be asked for this week by The Texas-New Mexico Pipe Line Company for the laying of a 16-mile 6-inch extension from its Monument field system to the Lovington pool, Lea County. Right-of-way has been purchased for the project, which was originally authorized last March. The line will have a capacity of 6000 barrels daily, and is scheduled to begin running oil from all Lovington pool wells by mid-June.

WEEK'S DRILLING HIGHLIGHTS

North Texas

Near Mankins, Archer County, a wildcat will make a high-gravity-oil producer from Bend lime. The third test of the Burns two-well pool, Clay County, was a disappointment, as were attempts to develop a lower lime pay at Walnut Bend, Cook County.

Arkansas

Stamps field, Fayette County, is promised a second well in Glen Rose formation. The second producer for Atlanta, Columbia County, is having to be retested. Magnolia field's water level was fixed at 7691 feet.

North Louisiana

Five miles northeast of Shreveport's producing limits a wildcat was running 110 feet high on markers. Lower Marine pay at Cotton Valley got an east extension.

East Texas

A large gas well was completed in a 6185-foot Glen Rose lime horizon hitherto unproductive in Waskom district, Harrison County.

South Louisiana

Paradis prospect in St. Charles Parish was converted into a new gas distillate field. Cores of Wilcox oil sand indicated an east extension for Eola, Avoyelles Parish.

Indiana

Cypress sand contributed a new producing horizon in Gibson pool, Gibson County, but an outpost found the regular McClosky horizon dry. A wildcat in Marrs Township cored 27 feet of Waltersburg saturation, but continued drilling.

Kentucky

A Henderson County wildcat near Reed produced 10 barrels an hour on pump. Corydon's discovery well is pumping 200 barrels daily.

Illinois

Aux Vases sand, hitherto unproductive in Washington County, held saturation when drilled into in Cordes pool. McClosky sand, hitherto unproductive in North Olney drilling may be revived as a result of promising showings in a well which penetrated McClosky.

Southwest Texas

Two Bastrop County wildcats may revive Balcones fault exploration; one shows in Dale lime, the other in Edwards lime. Jim Wells County has a new field near Ben Bolt. A fourth sand, Frio, was added to the Richard King area of Nueces County. Salt water dimmed prospects of Francitas field, Jackson County. Starr County was busy; Barbacoas area accounted for a new field; Rincon was getting a 2-mile extension and Ricaby one of 3500 feet. Small Mirando-sand production was obtained from a shallow wildcat in Webb County. Maetze structure, Goliad County, had a test showing for oil.

Rocky Mountain States

Cole Creek, Natrona County, Wyoming, recorded a new producing horizon in Dakota sand at 7930 feet. Kevin-Sunburst, Montana, got what may turn out to be the best well completed there in years—60 barrels of naturally flowing production in 12 hours. A test in Cut Bank, Glacier County, Montana, gushed over the crown block, but no estimate of the production was released.

Texas Gulf Coast

Darrington prison farm in Brazoria County apparently is a new field, a wildcat thereon having flowed 13 barrels hourly before shaling up. The second test at Caplen, Galveston County, was a producer, as was a test on the southeast flank of Esperson, Liberty County. A wildcat in Glen Flora area, Wharton County, was reported running high. The first Wilcox test near Willis, Montgomery County, was a failure at 7401 feet.

Oklahoma

Kiowa County furnished the state's fourth field of the year when a Viola lime completion averaged 100 barrels an hour. A Pittsburg County wildcat blew out as a result of Wilcox sand pressure.

Comparison of Permits Granted for New Wells

STATE	Week Ending May 20	Total this Mo.	Total this Year	Total this Date Last Year	1938 Year Total
Arkansas	8	14	78	89	247
California	17	70	396	495	1,146
Louisiana	38	87	435	474	1,214
Kansas	41	115	521	650	1,453
Michigan	29	97	454	294	953
Oklahoma	47	153	800	845	1,978
Texas	221	636	4,228	5,733	12,369
Total	401	1,172	6,912	8,580	19,360

Summary of Wells Completed in the United States Week Ending May 20, 1939

	Completions	Oil Wells	Gas Wells	Failures	Initial Production	Total 1939	Total This Date 1938
Alabama	....	....	....	....	.....	1	2
Arkansas	2	1	....	1	30	82	90
California	21	16	1	4	15,699	415	466
Colorado	....	....	....	....	.....	9	4
Florida	....	....	....	....	.....	....	1
Georgia	1	....	....	1	.....	1	....
Illinois	74	52	....	22	15,904	1,385	359
Indiana	3	1	1	1	40	53	46
Kansas	26	18	2	6	18,991	473	707
Kentucky	9	6	....	3	365	236	271
Louisiana	24	13	....	11	3,606	381	407
Michigan	37	18	1	18	15,623	480	306
Mississippi	1	....	....	1	.....	2	8
Montana	3	2	1	....	192	43	24
Nebraska	....	....	....	....	.....	....	1
New Mexico	12	8	1	3	5,636	241	207
New York	7*	7*	....	....	27	184*	310*
Ohio	19	3	7	9	30	309	360
Oklahoma	46	32	5	9	17,378	773	855
Pennsylvania	21*	20*	1	....	28*	477*	925*
Texas	198	133	10	55	90,562	3,809	5,181
Utah	....	....	....	....	.....	....	....
West Virginia	9	1	7	1	4	191	302
Wyoming	3	2	....	1	433	53	39
Total this week	516	333	37	146	184,584	9,598	10,871†
Total last week	454	283	40	131	167,651	9,082	10,344†
Total this year	9,598	6,545	671	2,382	9,529,581	....	.....

* Includes water-input wells. † Includes 2 Tennessee completions

Oklahoma Fields

Kiowa County wildcat adds fourth strike of year.

Extension of Ramsey pool possible only to north.

Tulsa.—Kiowa County added the fourth Oklahoma field discovery for 1939 last week by completion of a well in Viola lime, whose output averaged 100 barrels an hour for short periods. Gled Oil Company drilled the well, Watkins 1, SWc NW 20-7n-17w, on leases assembled by Shell Oil Company and farmed out to Russell S. Tarr of Tulsa.

Although the producing formation is yet in doubt, it is being accepted as Viola lime, characteristics of which are such that the discovery is not given the importance that would be attached to one completed in more consistent formations. The hole began showing gas at 1025 feet; first oil was found at 1050 feet. The first flow came after one foot of drilling. Later the well was deepened to 1055 feet, where output as high as 140 barrels per hour was made on tests. Late last week tubing was run and final completion will be recorded on tests to be made with this equipment installed.

The discovery is on the north side of the Wichita uplift. This part of the state has a few small oil fields, some of which produce at even shallower depths.

Defining wells for Wilcox sand production in Ramsey pool, Payne County, were completed last week. Gulliam 1 of E. H. Moore, Incorporated and British American Oil Producing Company, SW NE NE 18-18n-2e, found top of the Wilcox sand at 4890 feet and a core to 4893 had slight saturation. At 4913 feet, however, hope of Wilcox sand was abandoned and testing began to determine advisability of seeking production from the Hunton lime, which has had saturation in other wells. This well is but one location north of Walters 2 of Stanolind Oil & Gas Company and Associates, farthest northeast production in the field. On the southeast side of the field and two locations both south and east of producing wells, T. N. Berry et al abandoned Whitley 1, NW SE SE, 18-18n-2e, after finding the Wilcox sand dry from 4954 to 4975 feet.

These dry holes leave further expansion of the field possible only to the north, as there are dry holes ½ mile south of production and west of production.

The eastern part of the state had one favorable report, a blowout in the Pittsburg County wildcat of Phillips Petroleum Company, Hubacher 1, C NW NE 11-7n-15e. After coring in the top of the Wilcox sand at 7517 feet, part of the drill pipe was blown against the crown block and 2000 feet of the pipe dropped back in the hole. Significance of the gas blowout can not be determined until derrick has been repaired and the fish cleaned up.

Other developments for Oklahoma included a continued high rate of activity for the Seminole area, especially the St. Louis and the Shawnee fields, indications of a one-location eastward extension for the Ramsey field, Payne County; starting three more wells for the Coyle pool, also in Payne County; and wildcat wells in Caddo and Harmon counties.

The state held to its recent high level in field activity, with the starting of 47 wells in the week and the completion of an equal number. The completion list included 32 oil wells, whose combined initial output was 17,378 barrels, substantially higher than the average of the past year.

Action of the Kiowa County strike was its most encouraging feature. Since being deepened to 1055 feet it has averaged 100 barrels an hour in its brief periods of testing. The flow has been by heads through 10-inch casing and it has not been allowed to produce for a consecutive 24-hour period. Source of the oil has not been determined. First information indicated that the flow was from the top of the Simpson. Since then incompleted studies have indicated that the oil is from Viola lime, which has given so many spectacular instances of brief flowing life that the possibility of output from this formation leaves the well in questionable status.

The hole was drilled with cable tool machine. It began showing gas at 1025 feet. First oil began showing at 1050 feet. One foot deeper it made its first oil through open hole May 14. Casing was lowered and set at 1020 feet. After bailing down it made heads of oil for two days. The hole was deepened to 1055 feet May 16 and thereafter its output increased to an average of 100 barrels an hour. The heads were intermittent, some of them kicking out 140 barrels in one hour.

Production soon filled available storage and pits were dug to take care of output during further testing. So far the well is without pipe line connection and arrangements are being made to move the output by truck.

The test was drilled by the Gled Oil Company, which came into the deal with Russell S. Tarr of Tulsa. Tarr took the acreage on a farm out from Shell Oil Company, which assembled the block after seismographic prospecting two years ago. Other concerns with nearby leases are Argo Oil Company, Deep Rock Oil Company, Mid-Continent Petroleum Corporation, Phillips Petroleum Company and Sinclair Prairie Oil Company.

Nearest production is the Gotebo field, 6 miles east, also in Kiowa County, which has been making both oil and gas since 1908. Its production is from six uncorrelated formations from 460 to 2825 feet. The Granite field, 20 miles west in Greer County, has had gas and oil production since 1901. Its 7 producing formations, both oil and gas, are classed as uncorrelated sands. Depths are from 195 to 1550 feet. Neither of these fields has been of consequence as a source of oil and development has been intermittent.

Geologically the well is north of the Wichita uplift, an area of steep folding.

Another Oklahoma wildcat to bring encouragement was the Pittsburg Coun-

Oklahoma Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Carter—		
Sinclair Prairie, Richards 19, se nw se nw 9-4s-3w	30	1084
Comanche—		
Wichita Oils, Palmer 11, se ne nw nw 28-2n-10w	3	462
Richards, Price 1, ne sw nw 29-4n-11w	*	950
Creek—		
Doke et al, Lamons 1, c se se 4-14n-10e	17	2698
Lease Investment, Miles 2, se se nw nw 28-14n-10e	90	1798
Jordan, Hankins 1A, sw ne nw nw 25-15n-10e	75	2554
Freeland et al, Polson 1A, nw nwc se 11-17n-9e	15	1940
Schamblin, Horaney 1, sw se nw 18-17n-11e	¶3	2261
Kessler, Franklin 2, ne nw ne 29-18n-9e	50	2893
Jackson, Stanley 2, sw nw se 33-18n-10e	*	2680
Pepis, Land 4A, c n½ sw sw 12-18n-11e	8	1664
Sooner O&G, Lasley 1A, ne se sw se 9-18n-12e	abnd.	lcn.
Johnson O&R, Finley 3, nw ne nw 27-20n-9e	42	2048
Hughes—		
Shelton et al, Gilmore 7, cwl nec se 7-5n-9e	*	970
Davon, Westly 1, c s½ se nw 5-8n-10e	¶7	3852
Jackson—		
Burnham, Hensley 1, swc nw 10-1n-20w	12	1590
Ray et al, Ronald 2, se sw nw 5-1s-19w	124	2582
Kiowa—		
Emerson, Hancock 1, se sec 26-6n-15w	*	520
Moore et al, Harris 2, ne nec se 2-6n-17w	*	605
Logan—		
Sinclair-Prairie, Crews 2, ne sw ne 27-16n-1e	¶3	5209
Okfuskee—		
Shell, Gahagen 3, sw ne nw 11-11n-8e	843	3394
Okmulgee—		
Grandfield, Sells 7, ne nwc sw 9-14n-15e	*	1740
Payne—		
Magnolia, Jerry Cain 2, c e½ nw sw 12-17n-1e	615	4871
Mid-Continent, Ramsey 10, ne se nw 18-18n-12e	6349	4840
Mid-Continent, Columbia Wetzel 7, nec sw 18-18n-2e	6000	4837
Starr, Georgia 1, se sw ne 35-18n-4e	¶1.2	3490
Pontotoc—		
Moore, Payne 1, se nw se 16-4n-4e	*	1200
Pottawatomie—		
Mid-Continent, Cecil 1, swc ne 6-6n-4e	345	4288
Magnolia, Billington 8, nw sw ne nw 22-7n-4e	290	3197
Berkey, School Land 2, nw ne ne 36-7n-4e	125	4332
School Land 4, sec ne 36-7n-4e	250	4412
Magnolia, Billington "B" 2, ne se nw 21-7n-5e	220	2785
Trigg, Roberts 1, nec se 21-7n-5e	205	2740
Magnolia, Tull-Fyke "G" 3, ne nw ne 29-7n-5e	440	4202
Sinclair-Prairie, Wolf 5, nw nwc 29-7n-5e	10	3200
Berkey, Triplett 1, nec se 33-8n-4e	360	3881
Indian States, Williams 1, se ne ne 6-10n-4e	250	4400
Seminole—		
Smith et al, King 1, nec sw 4-5n-6e	8	3150
Cooper, Cosar 2, ne nw sw 12-6n-5e	*	3005
Grisso, Johnson 1, ne sw sw 27-6n-5e	230	2730
Pure, Reed 19, ne nw se 14-8n-6e	30	4318
Phillips, Fixico 2, ne sw nw 20-9n-6e	14	4289
Stephens—		
Skelly, Robertson 3, sw sw nw ne 35-1s-5w	8	734
Pace, Allen 23, sw sw ne nw 3-2s-8w	170	2214
Allen 24, se ne sw ne 3-2s-8w	150	2204
Tulsa—		
Stewart et al, Perkins 5, c se nw 5-17n-14e	*	1506
Wagoner—		
Sewell, Joseph 1, sw se ne 30-17n-18e	¶1/3	1107

* Failures; † Junked; ¶ Million cu. ft. gas.

ty test of Phillips Petroleum Company, Hubacher 1, C NW NE 11-7n-15e, in the eastern part of the state. Until derrick has been repaired and a fishing job cleaned up, full import of a gas blowout at 7517 feet will not be known. At this depth the hole was in the top of the Wilcox sand, where a core had been taken. While coming out of the hole, a blowout resulted, drill pipe was blown against the crown block, and 2000 feet of the string fell back in the hole. Indication is that the gas came from the Wilcox, since no showings had been encountered at higher levels.

A test will be made by perforation in the Love County wildcat of Sinclair Prairie Oil Company, Stockton 2, NEc SW 26-6s-2w, which has been plugged back to 6834 feet.

Caddo County drew a wildcat test last week, Yoeman 1, SW NW NW 1-6n-13w, where Sinclair Prairie Oil Company will test a block recently assembled. The location is north of the Smith 1, C NE NW, 2-5n-12w, which has been shut down at 2560 feet since last October. Smith 1 had gas in the Viola lime at 2545 feet, considered high for the area.

A second well for the recently discovered West Doyle pool, Caddo County, was started by Phillips Petroleum Company, Coombs 1, SE SW NE 6-1n-5w. The new field has been granted spacing of 20 acres.

Patsy Oil Company to spud Holt County test soon

St. Joseph, Mo.—Drilling on the Holt County block of Patsy Oil Company in Forest City Basin is to start shortly following a deal between the concern and the Manahan Drilling Company, Tulsa. A derrick has been standing for several weeks for Gaffney 1, SEc SW 24-63n-40w.

Testing of the Hunton lime in the Holt County test of J. H. Everett and associates, Spring 1, SWc SE 30-62n-38w, will be started now that a fishing job has been completed at 2355 feet.

In Clay County, Hooper & Webb are drilling below 1000 feet in Black 1, NWc 36-52n-32w. At this depth the hole was in Mississippi lime. Small oil showings were reported between 915 and 965 feet.

The first derrick to be erected in the basin, H. V. Elwell et al's Taylor 1, SW NW NE 12-62n-21w, Sullivan County, will have a rig soon.

The Missouri part of the basin now has 13 tests either drilling, shut down or in the location stage.

Magnolia gets permit to recycle in West Texas

A permit to operate a recycling and repressuring unit in three West Texas fields was granted to Magnolia Petroleum Company by the Texas Railroad Commission last week. The gas will be returned in the Kermit, Scarborough and Keystone (Colby sand area) fields, Winkler County.

The company plans to use producing wells for injection purposes, changing input wells from time to time. The order permits the company to produce the allowable ordinarily assigned to input wells from other producers on the same lease.

The plan calls for injection of gas on the J. B. Walton and State-Walton leases, Winkler County.

Kansas Field Developments

Habiger North appears as new Arbuckle lime pool. Marchand pool, Barton County, extended half mile.

Wichita.—Ellsworth County drew the one new pool opened in Kansas last week. The well, Gulf Oil Corporation's Janssen 1, SWc 29-17-10w, made potentional of 716 barrels from 3272 feet in Arbuckle lime. It has been named Habiger North, being ¾ mile north of Habiger and ½ mile east of Bloomer field. The well began showing for production two weeks ago.

The week brought development to indicate a mile westward extension for Marchand pool, Barton County, and ½ mile extension for the one producing well in the Barnholdt pool, McPherson County.

Drilling activity took a spurt in Kansas last week when 41 locations were made. This brought the number of active wells into the state above 225. Meanwhile 27 wells were being completed, 18 of which made combined initial oil output of 18,991 barrels.

Assurance of the new pool for Ellsworth County came with potential rating of 716 barrels on a pumping test for Gulf Oil Corporation's Janssen 1, SWc 29-17-10w, from Arbuckle lime total depth 3272 feet. The pool has been designated Habiger North by the conservation division of the Kansas Corporation Commission. The well is ¾ mile north of production in Habiger and ½ mile east of production in Bloomer.

An extension of a mile to the west for the Marchand pool, Barton County, was indicated by showing of the wildcat of Crown Petroleum Company and Elmer Ash, Koch 1, NEc 23-20s-12w. Oil rose 700 feet in the hole from Arbuckle lime between 3333 feet and 3358 feet. It is four miles southwest of the Ellinwood pool. On swabbing tests it was making some water. The lime will be acid treated.

Casing has been cemented for testing an indicated extension for the Barnholdt pool, McPherson County. Continental Oil Company had top of the chat at 3292 feet and cored to 3297 feet in Mattison 1, C WL NW 31-20-5w. It is a half mile from the discovery well and only producer in the pool.

A second well has been started as an offset to the discovery well in Johnson County, eastern Kansas and considered within the Forest City Basin. O. K. Supply Company will drill Kobe 2, NW NE NE 15-14-22e, northwest of Kobe 1, C NE NE 15-14-22e, which was completed May 10 in the Bartlesville sand for 30 barrels of oil. Top of the formation was at 693 feet, saturation between 705 and 726 feet.

An extension for the east side of the Gurney pool, Russell County, seemed assured when oil rose 2800 feet in the hole from Arbuckle lime between 3250 and 3258 feet in Reinhardt 1, SE NE NE 24-14-17w. Potential will be taken this week.

Campbell pool, Rice County, drew a ½-mile extension to the west with potential rating of 575 barrels in Truesdale 1, NWc 34-19-9w, drilled by George W. Hinkle. The well is producing from Arbuckle lime at 3217 feet.

Production from the Lansing Kansas City lime zone for South Burnett, Ellis County, was promised when oil rose 2500 feet in the hole. Depth of the test is 3115 feet. Other production in the pool is from Arbuckle lime.

Two miles northeast of Silica, Rice County, the wildcat of Vernon Oil & Gas Company, du Pont 1, SEc NE 22-19-10w, was abandoned in Arbuckle lime which carried water at 3325 feet.

Kansas Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Barber—		
Barbara O&G, Thompson "C" 1, c sw 16-33-13w	¶21.5	4647
Barton—		
Sinclair Prairie, Schmitt 1, sw nec nw 20-16-11w	213	3310
Stanolind, Schaufler 4, c ne se 9-20-11w	*	3320
Sinclair Prairie, J. Prusa 2, nec 20-16-11w	518	3320
Stanolind, Panning 19, c s½ nw 11-20-11w	1828	3280
Butler—		
National Refg., Pray 1, sw nw sw 31-27-3e	¶2	2020
Cowley—		
Lloyd et al, Chamness 1, nec sw 35-30-3e	*	3457
Pryor et al, Clark 1, se sw sw 4-33-6e	Abnd.	Lcn.
Ellsworth—		
Weaver, Johnson 1, sec sw 21-17-8w	1259	3249
Continental, Fuller 3, se nwc se 28-17-8w	917	3226
Transwestern et al, Daugherty 1, swc ne 33-17-10w	1718	3282
Greenwood—		
Reed et al, Ellingson 1, sec nw 8-28-11e	17	1233
Johnson—		
O. K. Supply, Knabe 1, c ne ne 15-14-22e	30	856
McPherson—		
Nadel, Mun 2, swc 6-20-1w	20	2982
Reno—		
Carlock, Teter 1, swc 30-22-4w	*	3942
Rice—		
Duwe et al, Williams 1, 110 ft w se ne se 6-19-9w	401	3253
Gulf, Barngrover 1, c w½ sw sw 30-19-9w	1322	3284
Gerbrand et al, Johnson 2, csl se nw sw 31-20-7w	887	3329
Mid-Plains, De Weese 1, csl se ne nw 10-21-7w	305	3375
Russell—		
Phillips, Antherton 1, c ne se 30-13-14w	834	3317
Phil-Han, Hill 1, se sw sw 16-14-14w	*	3350
Stearns et al, Olson "B" 1, nec 28-14-14w	1961	3224
Coralena, Sellens 1, nwc se 17-15-13w	1262	3240
Cities Service, Resner 1, nec sw 23-15-14w	2560	3343
Sedgwick—		
Century, Wilke 1, sw se sw 1-29-2e	*	870
Stafford—		
Lauck et al, Cullison 1, swc 18-24-13w	*	4233
Continental et al, Mather 1, sec nw 12-25-13w	2939	4125

* Failures; † Junked; ¶ Million cu. ft. gas.

Illinois Developments

Aux Vases yields saturation in Washington County.

Promising McClosky zone may revive North Olney.

Olney, Ill.—Murray et al's Geppert Roadway 1, NE NW 15-3s-3w, 1 mile north of the discovery well in the new Cordes pool of Washington County, cored pay sand between 1285 and 1305 feet which operators believed to be the Aux Vases, as yet unproductive in that county. Casing was set to the top of saturation. Other production in this rapidly growing pool is from Benoist sand. Magnolia Petroleum Company, largest operator in the pool, had five completed producers and 7 in various stages of drilling.

In the Sandoval area of Marion County, where wells have been producing from the Benoist sand for the past 30 years and a single Niagarian lime producer was drilled last fall, E. E. Hines' Hazelwood 1, NE NE SW 8-2n-1e, Sandoval Township, set pipe to the top of the McClosky, to which depth the hole had been drilled by a portable rotary rig, and was preparing to deepen with a cable outfit. The wildcat was closely watched.

The state's deepest test, Kingwood Oil Company's McWhorter 1, C E SE NW 15-6n-6e, Union Township, was drilling at 6400 feet. Progress in recent weeks was slow as hard formations were penetrated.

A revival of activity in the North Olney pool of Richland County is expected following discovery of promising McClosky pay at Skinner et al's Sylvan Iris School 1, Section 23-4n-10e, between 3016 and 3024 feet. Casing was set to the top of the lime after the hole was drilled to 3025 feet. It's successful completion would call for offsets by Wicklund Development Company and The Texas Company.

The only other active operation in the pool last week was an east outpost, Wolf & Andrew's A. E. Wattleworth 1, Section 26-4n-10e, which was drilling at 2500 feet and expected to reach the McClosky level this week.

Disappointment

A Richfield County disappointment was abandonment of A. C. Leathers et al's A. Yonaka 1, NW SE SW 22-2n-14w, Bonpas Township, which came after weeks of effort to make a well from 4 feet of doubtful McClosky saturation cored months ago. Several attempts to shut off salt water and complete the well as a producer failed. Total depth was 3044 feet. In this same township and approximately 7 miles from the Yonaka wildcat, Kingwood Oil Company drilled the Provine 1, SE SE SW 3-2n-14w, to 3175 feet before abandoning it as dry. Started after the Yonaka test recovered McClosky saturation, it topped the Ste. Genevieve at 3020 feet. Other tests are expected in the vicinity this summer on the strength of the Yonaka showing.

Following an initial production of 600 barrels daily at its Russell E. Storer 1, NE NE NE 23-4n-9e, Denver Township, furnishing a half-mile northeastern extension to the Noble-Denver pool of Richland County, Pure Oil Company announced nine new locations for the area. Production at the extension test is from the McClosky lime, while most wells thus far drilled in this area produce from the higher Cypress sand.

The new locations and their status last mid-week were: Otis Barker 1, SE SW SE 14-4n-9e, awaiting rig; C. A. Bower A-1, SW NE NW 25-4n-9e, awaiting derrick; H. Cazel 5-B, NE NW NW 25-4n-9e, location; Sayre Consolidated 1, SW SW SW 13-4n-9e, surface pipe set; Omer Sayre 1, NE NE NW 24-4n-9e, awaiting rig builders; Storer-Sayre Consolidated 1, NW NW NW 24-4n-9e, location; C. H. Storer A-1, SE SE SE 14-4n-9e, building derrick; Storer Consolidated 1, SW NW SW 13-4n-9e, location, and George Wells 2, SE SE NE 23-4n-9e, location.

A western outpost to the Clay City pool of Clay County, Orchard Oil Company's (Dunlap Orchard's) M. C. Norton 1, Section 18-2n-8e, was being closely watched as it made hole rapidly below 1600 feet. Its successful completion would indicate a connection between the Clay City pool and Wiser's Olson pool.

Production records in the Lake Centralia-Salem pool of Marion County fell last week when Luke E. Hart et al's Young School 2, Section 20-2n-2e, Salem Township, was completed in the McClosky lime with a flowing production of 6000 barrels a day. The production record had formerly been held by Young Church 2, ¼ mile east which started at 4800 barrels daily after acid treatment two weeks ago. The latter well had produced 100,000 barrels before given acid treatment.

Approximately a quarter-mile south of the Wilfred W. Michael 1, a very light producer, Carter Oil Company will drill J. B. Akers 1, NW SW SW 1-11n-7e, 3 miles south of Centralia.

A White County wildcat, Mazda Oil Company's Carmi Baptist Orphanage 1, SE SE NE 22-5s-9e, Carmi Township, cored 15 feet of Cypress sand saturation below 2840 feet and was drilling ahead to the McClosky lime. Sun Oil Company's C. W. Ford 1, NW NE NE 18-5s-14w, Hawthorne Township wildcat, passed through Cypress saturation not porous enough to make a well and was drilling below 2880 feet toward its destination, the McClosky, while Superior Oil Company's E. M. Fitton 1, SW SW NE 25-4s-14w, wildcat 1½ miles northwest of New Harmony, Phillips Township, was drilling below 1850 feet.

In Sangamon County, location of the state capitol and north of the present development area of the Illinois basin, Millar's G. W. Sample 1, NW SW NE 11-15n-3w, Cooper Township, was preparing to resume drilling from 1922 feet, original contract depth, to make a test of the deeper Trenton and St. Peter limestone. These deeper formations, although punctured in several sections of the state without marked success, are considered the most promising for future exploitation in north central Illinois counties. The wildcat, which had encountered a very slight saturation in the Devonian at about 1800 feet, will be taken to 3200 feet.

Illinois Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Christian County—		
G. W. Nelms, Howell 1	*	450
Clark County—		
Kingwood Oil Co., Miller 1	*	2573
Phillips & Kost, Shuey 1	10	505
Clinton County—		
Santa Fe O&G Co., Maddox 4	*	1203
Coles County—		
W. R. Miller, Giffin 1	10	538
Fayette County—		
Rosenthal, Washburn 9	340	1612
Kingwood Oil Co., Smith 4	60	1563
Carter Oil Co., Durbin 2	297	1555
Durbin 3	331	1584
Edwin Shelton 2	197	1575
Wilbur Hawkins 1	116	1522
Florence Harding 6	128	1540
Orin Sidener 4	300	1556
C. Owens 1	101	1546
James Feezel 4	192	1560
T. B. Taylor 3	350	1568
Martha Tirrey 4	528	1579
Martha Tirrey 5	756	1579
Mary Dial 1	252	1553
Lucy Logue 1	118	1539
Pete Hoffman, 1st National Bank 1	*	1610
1st National Bank 2	*	1650
Magnolia, Watson 1	72	1512
Whisenant et al, Smith 10	110	1584
Smith 11	*	1624
R. B. Creager, Hiatt 2	420	1558
Stewart Oil Co., C. E. McPheeters 2	150	1585
Dixie Oil Co., Sidner 2	*	1596
Franklin County—		
Gulf, U. S. Steel 1	*	3435
Gallatin County—		
Miller et al, Big Barn 1B	*	610
Hancock County—		
Minnie & Grady, Roberts 1	3	382
Jefferson County—		
V. O. Lewis, Bates 1	*	1839
Midfield Oil Co., R. T. Ervine 1	*	2310
Beavers et al, Eichmann 2	*	2285
Marion County—		
Hawley O&G Co., Copple 1	*	2283
Johnson & Betts, Johnson 1	*	1923
Johnston et al, Cole 2	325	1879
Magnolia, Chitwood 27	525	2100
Chitwood 28	290	2070
W. B. Young 16	480	1787
D. A. Shanafelt 19	497	1838
Potter Bros., M. & I. RR. 3A	1640	2091
M. & I. RR. 1B	425	1840
Max Pray, Langenfeld 1	*	3098
Cole 4	500	2086
Heenan-Coe, Millican 1	*	2556
Texas Co., O. Johnson 12	490	1771
O. Johnson 13	252	1772
O. Johnson 14	315	1784
O. Johnson 15	203	1784
V. Kalkbrenner 23	259	1796
V. Kalkbrenner 24	280	1795
Pittenger 8	175	1820
C. Richardson 4	623	1761
W. C. Wright 1	*	2210
E. Jett 12	35	2081
E. Jett 14	238	1883
E. Jett 15	105	1845
W. Carr 1C	245	1774
W. Carr 5A	70	1783
English 7	*	2874
R. Fyke 7	1750	2064
M. Johnson 3	238	1883
F. Shanafelt 2	*	2040
S. Stonecipher G-1	I	1768
C. Farthing G-1	I	1862
Monroe County—		
Ames Dr. Co., Gummershiemer 1	29	434
Montgomery County—		
Independent Producers & Refiners, Niemann 1	*	100
Fred DeMier, Charles Kanady 1	*	871
Richland County—		
Kingwood Oil Co., Provine 1	*	3175
Pure, Cazel 5	165	2632
Cazel 6A	160	2630
Wayne County—		
Pure, Gill 1B	555	3100
Whitcher Dr. Co., Fitch 1	194	3100

"I" indicates gas input wells.

* Failures; † Junked; ¶ Million cu. ft. gas.

West Virginia Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Calhoun County—		
Starcher et al, Slider 2	¶.16	2181
Kanawha County—		
United F. G. Co., Gibson 4826	¶5.63	5021
Price et al 4827	¶7.65	5149
Pleasants County—		
R. E. Bills, Baker 1	*	2200
Ritchie County—		
Astron Oil Co., Sutrsberg 16	4	679
Roane County—		
Reed et al, Hughes 1	¶.75	1476
Wayne County—		
Fraley Gas Co., Adkins 1	¶.52	3275
Wetzel County—		
Pittsburg & W. V. Gas Co., Morgan 5262	¶.11	3210
Bush et al, Sivert 1	¶1.50	2100

* Failures; † Junked; ¶ Million cu. ft. gas.

Kentucky Fields

Henderson County wildcat yields 10 barrels hourly

Owensboro, Ky.—On its first pumping test since completion a month ago, Springrose Drilling Company's Pillman 1, 1¼ miles northwest of Reed, Henderson County, produced at the rate of 10 barrels an hour when an 18 inch stroke was used with the pump operating at 27 revolutions per minute. Having swabbed at the rate of 840 barrels a day when completed, the pool opener is believed good for a settled pumping production of between 400 and 500 barrels a day with the pump operating at maximum efficiency.

The test was made possible with completion by Fordsville Gathering Lines, Incorporated, of a pipe line connecting the well to the L. & N. railroad tracks at Reed, from which point crude is being moved by tank car. The wildcat had topped the McClosky at 1966 feet, and was bottomed at 1972 feet.

In Daviess County, O. D. Vickers and "Gunboat" Smith spudded the T. J. Turley 1 on a location ¾ mile northeast of J. C. Preston's C. H. Abell 1, which opened a new McClosky pool 6 miles northeast of Owensboro a week ago. It will be carried to about 800 feet with the spudder, and drilled on to the McClosky with cable tools. Meanwhile, tanks were being erected at the Abell 1. The Ashland-Owensboro Company will construct a line to the well, which is an estimated 200 barrel producer.

Central States Oil Company's (Hobbs, Hunsaker & Campbell's) W. J. Cox Estate 1, 5 miles southeast of Madisonville, Hopkins County, pumped 480 barrels from the Cunningham sand between 2061 and 2092 feet following acid treatment. Operators will deepen another 100 feet to the McClosky lime, and plug back if larger production is not found. A second well will be drilled in the vicinity by these operators, and the favorable results at the Cox 1 are expected to spur activity in that part of Hopkins County.

Two McClosky tests in the Corydon area of Henderson County were abandoned last week. Sun Oil Company's Lockett Heirs 1 was abandoned at 2723 feet when it failed to find commercial saturation at any depth, while Carter Oil Company's King-Pritchett 1 was abandoned at about 2650 feet.

The Corydon discovery well, Sun Oil Company and Kentucky Natural Gas Company's G. Trigg et al 2, was placed on the pump last week after flowing for some time at about 400 barrels a day. With a stroke between 20 and 25 inches, it was pumping about 200 barrels a day. The pump was agitating sufficient gas to flow the well one hour out of every four.

In McLean County, Cleopatra Oil Company's Nesmith 1, near Cleopatra, reported salt water at 2265 feet.

Kentucky Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Breckenridge County—		
Johnson et al, Snyder 2	†	200
Daviess County—		
J. C. Preston, Abel 1	200	1422
Globe Oil Co. et al, Clark 8	100	1200
Master Oil Co., Johnson 1	15	1675
Major Oil Co. et al, A. Westerfield 1	20	1031
McLean County—		
Phillips et al, C. Montgomery 2	*	1835
Muhlenberg County—		
South Penn Oil Co., Rogers Bros. 1	*	2234
Ohio County—		
Ken-State Oil & Gas Co., Fentress 3	20	610
Rex Pyramid Oil Co., Helm 1	10	550

Ohio Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Ashland County—		
Gold Crown Oil Co., Easley 3	5	....
Athens County—		
Hartley et al, Baker 2	5	1131
Ohio Fuel Gas Co., Phillips 1	¶.06	1535
T. Wallace, Hitt 1	¶.15	1456
Cuyahoga County—		
Benedum-Trees, Miner 1	¶2.00	2789
Sterling Miner 1	¶3.00	2849
Holmes County—		
Bryan et al, Garver 2	*	744
Knox County—		
Perkins, Miller 1	*	2790
Ohio F. G. Co., Welker 1	*	3030
Licking County—		
C. A. Davis, Hughes 1	¶.60	2582
Medina County—		
Burtner et al, Swineheart 1	*	3945
Muskingum County—		
Atha Oil Co., Patterson 1	*	4850
Noble County—		
Ohio F. G. Co., W. James 1	¶1.15	1527
Perry County—		
Altier & Sons, Gladden 2	¶	1105
Stark County—		
Lyons Co., Sheets 1	*	4491
Brendal Prod. Co., Congress Lake Club 1	*	4739
Burtner & Morgan, Correll 1	*	4677
Washington County—		
Charles Roberts, Martin 1	¶	968
De Puy Bros., Hendershot 4	20	1469

* Failures; † Junked; ¶ Million cu. ft. gas.

Indiana Developments

Cypress sand contributes new pay for Gibson pool

Evansville, Ind.—W. F. Lacy's Cooper-Thomas 1, NW SW SW 18-3s-13w, Wabash Township, Gibson County, started pumping at the rate of 25 barrels an hour from 27 feet of Cypress sand saturation, topped at 2501 feet. It opens a new producing horizon in the Gibson pool, from which several large wells are producing from lower McClosky lime. An outpost, the Cooper-Thomas had found the McClosky dry and plugged back.

Continental Oil Company's Cooper 2, NW SW SE 12-3s-14w, topped 15 feet of Cypress sand saturation at 2498 feet, seven feet of which were described as "very good," and was drilling on to the McClosky. W. F. Lacy and Norman Kahn are to move in materials for Cooper 2, northwest of their Cooper-Thomas 1.

Gibson County wildcat failure of the week was W. R. Nicholson's Perry Fleener 1, SE NW NW 25-3s-13w, Wabash Township, which found sulphur water in the McClosky between 2762 and 2768 feet. It was plugged at 2808 feet.

In Daviess County, Midwest Development Corporation's George K. Kiefner 1, NW NE NW 2-2n-5w, Barr Township, set casing in the Trenton lime at 2900 feet. It is being drilled with cable tools.

After coring 27 feet of commercial Waltersburg sand saturation below 1747 feet, Illiand Oil Company's Charles Strueh 1, C S NE SE 1-7s-6w, Marrs Township, was coring for the Jett sand at 1820 feet.

Indiana Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Monroe County—		
W. B. Pardoe, Union Trust Co. 1	*	2502
Posey County—		
Sun, Dietz 4	40	1919
Sullivan County—		
Reed et al, Hunt 1	¶	822

* Failures; † Junked; ¶ Million cu. ft. gas.

Panhandle currently most active starting area in Texas

The Texas Railroad Commission last week approved permits for drilling 221 new wells in Texas, 51 less than were allowed the previous week.

East Texas operators reported 13 new locations, including 12 in Gregg and 1 in Rusk County. There were 10 permits listed from the remainder of the East Central Texas area.

The commission approved 47 locations in the Gulf Coast section, while 19 were approved in Southwest Texas. West Texas producers reported 33 permits and 16 were listed from West Central Texas.

The Panhandle led the list with 54 locations, including 18 in Hutchinson and 11 in Yoakum County, while permits for 29 wells in North Texas were approved.

Reset Navarro Crossing hearing for June 1

The Texas Railroad Commission has scheduled its hearing on the Navarro Crossing field, Houston County, for June 1, at Austin. The hearing was originally set for May 10, but all affected operators failed to obtain notice.

Hearing postponed

The Texas Railroad Commission has postponed indefinitely its hearing on the Conoco-Driscoll field, Duval County, which was set for May 23, at Austin. Operators asked for more time to prepare evidence.

East White Point hearing

A hearing to fix operating rules for the East White Point field, San Patricio County, has been scheduled for June 2, by the Texas Railroad Commission. The hearing will be held in Austin.

New York Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Allegany County—		
N. V. V. Franchot, Reddy farm, Bolivar	4	1441
N. V. V. Franchot, Reddy farm, Bolivar	6	1452
N. V. V. Franchot, Reddy farm, Bolivar	5	1468
L. E. Norton, Coats farm, Scio	3	1070
Marsh Oil Co., Withey farm	9	1370
Allegany: Water Intake Wells		
Forest Oil Co., Ackerman farm, Bolivar	...	1415
Ebenezer Oil Co., Emerson farm, Scio	...	1060

Pennsylvania Completions
BRADFORD DISTRICT

Company, Well and Location	Init. Prod. Bbls.	Depth
Tapp, Gallets & Buffington, Trs., Fee	4	....
Ernest Meridan et al, Cleveland	1	....
Walker Bros. et al, 382-3 Bing	2	....
Penn Valley Crude Oil Corp., Redfield	7	....
Forest Oil Corp.	1	....
Forest Petroleum Corp., 2 wells	2	....
Niagara Oil Corp., 3 wells	3	....
Niagara Oil Corp.	1	....
Bradford Transit Co., 5 wells	5	....
Bradford: Water Intake Wells		
Lloyd & Hardy, Meehan	...	....
Forest Oil Corp.	...	....
Stoops, McDeavitt et al, P. Stoops	1	....
Middle District		
C. L. Irwin, Harriet & Laura B. Cross	1	....
New York-Pennsylvania: Gas Field		
Sylvania Corp., Della Calhoun	¶	....

* Failures; † Junked; ¶ Million cu. ft. gas.

West Texas Fields

Tests in Ector County showing unfavorable indications.

Pecos County Ordovician makes 87 barrels in 12 hours.

Midland, Texas.—Two wildcats in Ector County were listed as failures, and outposts in the North Cowden and Goldsmith areas were not showing favorable the past week. Landreth Production Corporation's Frank Cowden 1-A, intermediate test for the Goldsmith and Emma areas, logged nominal saturation in big lime before reaching sulphur water zone at 4310 feet, with an elevation of 3184 feet, and was plugged at 4617 feet. Magnolia Petroleum Company's T. P. Land Trust 1, 1-2/3-miles northwest of the Goldsmith field, failed to produce after 510-quart nitro shot after plugging back from water at 4524-57 feet to 4480 feet. Casing parted at 3220 feet.

Gulf Oil Corporation's Holt 1, half-mile west of the north end of the North Cowden field, yielded only a few gallons of oil hourly in drilling through the regular pay, and was drilling dry lime at 4722 feet in search of a lower oil level, or to establish the water table. Sinclair Prairie Oil Company's Holt 2, northwest edge test, was flowing 118 barrels daily last midweek while cleaning out following nitro shot. It was plugged back from 4300 feet to 4245 feet.

Sid W. Richardson et al's T. P. Land Trust 1, 1¾ miles south and the same distance southwest of production in the Goldsmith field, is reported to have checked low on the anhydrite marker, and was awaiting orders at 1643 feet. J. T. Barnes et al's E. R. Thomas 1, western Ector County wildcat, was drilling at 3820 feet, having topped the Yates marker at 2710 feet, with an elevation of 3277 feet.

Pecos County's recent Ordovician oil strike in the Masterson shallow area was shut in for storage May 14 after flowing 87 barrels of pipe line oil the previous 12 hours. It had maintained a slightly higher rate on the two previous 24-hour gauges. The discovery was drilled by Anderson-Prichard Oil Corporation and Monte Warner on the Masterson ranch, with production from Ellenberger at 4555-95 feet. The Texas Railroad Commission will hold a special hearing May 24 to fix rules governing future operations in the area, as more tests are planned for the near future.

Leidecker and Cain's Lehn 1, east corner H&GN Section 71, Block 10, shallow Pecos County discovery that is on a strike between the Masterson and Pecos Valley fields, was rated at 20 barrels of oil daily with considerable gas after 90-quart nitro shot at 1672-1743 feet. H. L. Cain et al are starting Lehn 1, half mile northwest. Both are on acreage farmed out by The Texas Company, with deep mineral rights reserved. Floyd C. Dodson et al have contracted to take over Trans-Pecos Oil Company's Popham 1-a, western Pecos County wildcat, and deepen to the Delaware zone. The latter began operations on Popham 1, NW SE GH&SA Section 235, Block 11, late in 1935, and junked several holes at shallow depths after prolonged fishing jobs and periods of inactivity.

Gaines County added a wildcat failure, and a second prospect developed small gas show in the Yates. Osage Drilling Company's E. H. Jones 1, C SE NW PSL Section 20, Block A-7, situated near previous failures, encountered sulphur water at 5144-46 feet, with an elevation of 3625 feet, and will be plugged. Humble Oil & Refining Company's Caswell 1, C SW SW PSL Section 10, Block A-24, logged gas show at 2983-97 feet, and was drilling at 3560 feet. A new wildcat for Yoakum County is being started by Emperor Oil Company and Chas. Million et al on the Webb tract, C NE SW Section 545, Block D, about 2 miles northeast of the West 1 well pool. Shell Oil Company's Waples-Platter 1, 2-mile northeast extension for the Bennett field, was installing pumping unit. Swabbing test after multiple acid treatments at a plugged back depth of 5312 feet indicates a commercial oil well.

Gulf Oil Corporation's Henderson 17, intermediate location for the Waddell and Jordan fields, Crane County, registered a potential rating of 7536 barrels of 33.1 gravity oil after using 5000 gallons of acid in pay at 3528-31 feet. The well flowed 513 barrels oil natural in 6 hours before running tubing.

The Texas Company's Mallet 1-C, NEc Labor 11, League 51, 2½ miles southwest of nearest production in the Slaughter field, Hockley County, flowed 552 barrels of oil initial, with the aid of 10 flow valves after using 2000 gallons of acid in broken lime at 4957-63 feet and 4988-5050 feet.

West Texas Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Andrews County (Fuhrman)—		
Fuhrman Pet. Corp., Ford 16	1650	4450
Crane County (Sand Hills)—		
Sinclair Prairie et al, Tubb 3	*	6167
Crane County (Jordan)—		
Sinclair Prairie, University 4-27	1208	3615
Ector County (Foster)—		
Arkansas Fuel Oil Co., Johnson 2-B	731	4220
Barnsdall, Johnson 6	470	4285
Ector County (Goldsmith)—		
Landreth Prod. Corp., Scharbauer 7-P	144	4195
Ector County (Jordan)—		
Parker Drlg. Co., McDonald - The Texas 1	2528	3675
Ector County (North Cowden)—		
Stanolind, Roberts 13	777	4480
Phillips, T. P. Land Trust 6	665	4196
Rushwold Oil Co., Woods 2	4765	4386
Ector County (Wildcats)—		
Landreth Prod. Corp., F. Cowden 1-A	*	4617
Magnolia, T.P. Land Trust 1	*	4565
Fisher County (Wildcat)—		
F. W. Bennett - F. K. Campbell, Martin-Shell 1	†	2204
Hockley County (Slaughter)—		
Richardson et al, Denton-Sun 1	660	4956
Howard County—		
Continental, Clay 14-A	305	3268
Eastland Oil Co. - Ambassador & White, O'Daniel 1	412	2827
Lockhart Pet. Corp., Scott 5	413	2900
Jones County (Wildcat)—		
S. C. Herring et al, Guitar Est. 1	*	2245
Travers Pet. Corp. et al, R. G. Swanson 1	*	3430
Jones County—		
Condor Pet. Co., H. Sayles 21	321	1952
W. J. Healey & Walters, Daugherty 8	378	1900
Lewis Prod. Co., Muenzler 2	468	3256
Sandy Ridge Oil Corp., Steffens 7	311	1901
Sprouls et al, J. Nichols 2	†	800
Ungren-Frazier et al, Griffin 7	1104	3231
Pecos County (Payton)—		
Jaffe et al, Cordz 3	180	2075
Sun & Atlantic, Payton 10-a	133	2086
Pecos County (Pecos Valley)—		
Messinger et al, Fee 2, sec 593	*	1341
Union O&M Co., Magnolia 5	310	1891
Pecos County (Shearer)—		
Childress Royalty Co., Masterson-I.T.I.O. 8	412	1467
Sahara Oil Corp., Shearer-Atlantic 4	281	1506
Shearer-Atlantic 5	395	1500
Stonewall County (Wildcat)—		
Forest Dev. Corp.-C. B. King Drl. Co., Ellison 1	*	3596
Upton County (McCamey)—		
Humble, Ricker 31-B	39	2410
Ward County—		
Gulf, Estes 118	853	2650
Mid-States Oil Corp., Sloan-Shell 4-A	28	2561
Winkler County (Kermit)—		
Magnolia, Walton 229	362	3235
Winkler County (Keystone)—		
Barnes et al, M. E. Crum 3-B	609	3332
Yoakum County (Wasson)—		
Murchison-Fikes, Elliott-Standard 6-B	1114	5098
Skelly, Thomas 3	1081	5145

* Failures; † Junked; ¶ Million cu. ft. gas.

Second oil pool being opened in Stonewall County

Abilene, Texas. — Stonewall County was assured of its second oil pool from the Palo Pinto lime horizon last midweek when Forest Development Corporation et al's Boyd 1, near C NW NE H&TC Section 45, Block D, pumped 187 barrels of oil and 33 barrels of water in 24 hours after a workover job. This wildcat began showing for a producer early last March from pay topped at 4708 feet. It was carried to bottom hole water at 4760 feet, then plugged back to 4732 feet for multiple acid treatments.

Texas gas hearing gets request for more volume

The Texas Railroad Commission last week held its monthly statewide hearing relating to gas proration. Nominations for June gas purchases were filed by the operating companies. These totaled 1,880,642,000 cubic feet daily from wells outside the Panhandle field, an increase of 9,745,000 cubic feet above the demand for gas in May.

The demand for gas from the East Panhandle field was 91,482,000 cubic feet daily and from the West Panhandle field the demand was 401,774,000 cubic feet. This brought the total demand for sweet gas from the Panhandle to 493,256,000 cubic feet daily.

The sour gas demand from the Panhandle was 1,265,231,000 cubic feet daily.

Phillips Petroleum Company requested a permit to commingle dry gas with casinghead in its plant at Eliasville in Stephens County. There was no reference made to oil proration at the hearing.

Texas Panhandle Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Carson County—		
Texas Co., Cooper 6	318	3220
Texoma Nat. Gas Co., Crutchfield 1	¶27½	2790
Gray County—		
Ochiltree et al, Saunders 4	213	3248
Sinclair Prairie, Merten 2-B	139	3278
Hutchinson County—		
Cree-Hoover et al, Haile 4	903	3040
Stansylvania Oil Co., Wisdom 6	446	3126
Moore County—		
Shamrock O&G Corp., Sneed 13	¶21¾	2848
Wheeler County—		
Christie-Hickman Drl. Co., Perkins 1	155	2487
Pendleton & Vaughn, fee 1	300	2239

* Failures; † Junked; ¶ Million cu. ft. gas.

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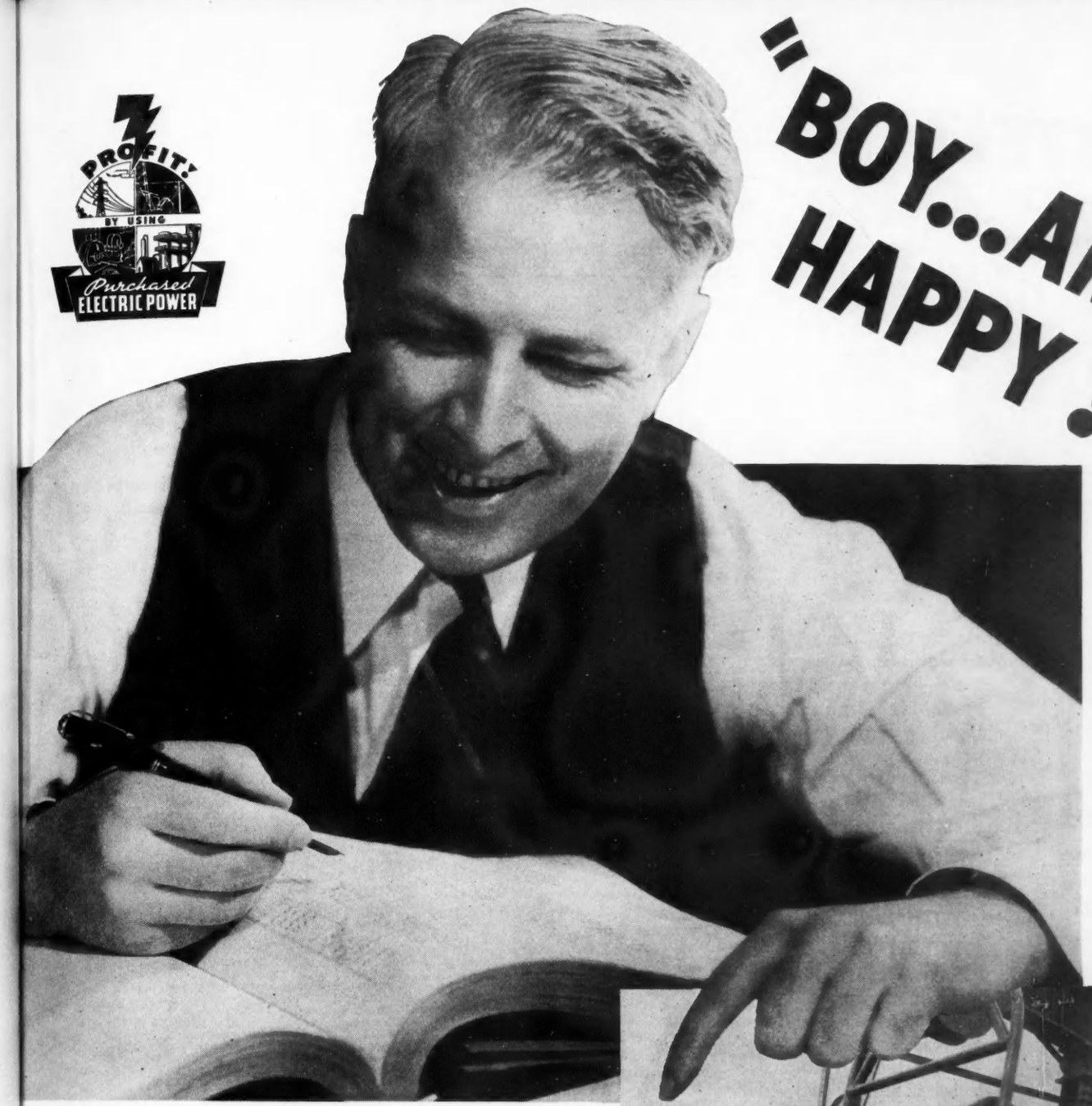

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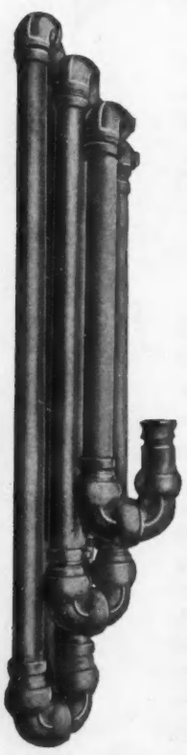

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North Texas Fields

High gravity oil from Bend lime in Mankins wildcat. Will attempt to establish deeper lime pay at Burns.

Wichita Falls.—Preliminary production tests given British-American Oil Producing Company's T. B. Wilson 1, northwestern Archer County wildcat 3 miles south of Mankins, affords assurance that a high gravity oil producer will be completed in the Bend lime at 4666-4739 feet. Eight-inch pipe was cemented on bottom, then gun-perforated at 4660-80 feet. The well yielded 250 barrels of oil on a 48-hour swabbing test. It was shut in for an equal period, resulting in the casing pressure building up to 850 pounds. The well then produced 120 barrels of oil by heads before exhausting its flowing pressure late last week before landing tubing. Acid will be used later. The company is prepared to continue its 5300-foot depth contract should the wildcat fail to make a producer from the deep lime.

Establisment of a deeper lime pay in the Burns two-well pool, western Clay County, will be sought by Shell Oil Company's Davis 1, south offset to the Strawn discovery in the 4450-foot lime. This prospect failed to indicate a producer in the regular oil horizon, and in fulfilling depth contract encountered favorable porosity and saturation in broken lime, sand and shale at 4942-5100 feet. Seven-inch pipe was cemented at 4923 feet. L. T. Burns and Consolidated Oil Company's Scaling 1, located two miles northwest of the pool, was drilling at 3050 feet, having passed up shallow shows.

The Nocona pool, Montague County's most promising Strawn discovery, has three operations underway. Rogers & Rogers' Astley 1, north offset to their 4656-foot discovery, was coring at 4480 feet. Top of the lime was called at 4156 feet. Stanolind Oil & Gas Company's Sachary 1, west offset to the flowing producer, was drilling at 900 feet. Bridwell Oil Company et al's Reynolds 1, a mile northeast of the town, was drilling at 2700 feet. A pipe line outlet for the area is being held up pending the completion of the discovery offset.

Development of the lower lime pay indicated for the Walnut Bend pool, Cook County, by Sinclair Prairie Oil Company's Best 8 will be held in abeyance due to the absence of a natural flow of oil from saturation at 5143-71 feet, with the hole bottomed in shale at 5173 feet. Swabbing tests rated the well at 200 barrels daily. Five-inch pipe cemented with 13 sacks of cement at 4151 feet has been pulled to try for a completion in the regular Strawn zone, topped at 4943 feet.

Testing operations through gun-perforated casing has failed to register commercial producers for British-American Oil Producing Company's two outposts in the Seymour pool, Eastern Baylor County. F. C. Green 1-L, located 3½ miles southeast of the company's 2600-foot Home Creek lime pumper, increased its yield to 25 barrels of oil daily without adding to the volume of water when 20 additional shot holes were made at 3065-75 feet. More perforations are to be made five feet lower. This outpost was drilled to 4304 feet, and plugged back to 3130 feet before landing pipe. The company's Cope 1, which quit in chert at 5598 feet, tested dry after perforating pipe at 2535-37 feet. The well gave promise of cleaning itself of mud when 10 hot holes were made at 2808-15 feet, and testing will be continued near this level.

North Texas Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Archer County (Hull-Silk)—		
B. L. Ligon-Deep Oil Dev. Co., Wilson-McCrory 2, lot 1	736	4320
Petroleum Producers-United Producers Co., Shephard 1	840	4322
Thurmond & Lipscomb, Wilson 3, lot 1	1120	4311
Archer County—		
Pete Anagnos et al, B. C. Andrews 3	6	970
Continental, DeMoss 6	115	989
Shappell Oil Co., G. Bell 23, blk 27	20	1013
Archer County (Wildcat)—		
Piper & Wilson, C. Cowan 1, sec 45	*	1095
Riner-Fain & Stilley, R. C. Kinder 1-B, blk 57	*	1360
Clay County—		
Beard et al, Spring 1	*	3962
Harvey Drl. Co., E. Michna 1, blk 28	*	1424
Kimmell-Lee & Co., Firestone 15, sec 23	*	1133
Metzner et al, Taylor 12, sec 23	20	1135
Taylor 14, sec 23	135	1131
Norwood et al, Duncan 2, blk 15	21	1191
Reid & Perskey, Stevenson 1, blk 3	*	466
Schram et al, Summers 2, blk 1	*	200
Sussex Oil Corp., Shumake 20, blk 4	18	1190
Clay County (Burns-Browning)—		
Burns et al, Browning Bros. 2, blk 70	912	4450
Cooke County (Wildcat)—		
Seitz Bros., Ltd., Harris 1	*	3341
Geo. Ross & Co., Inglish 1	*	1924
Grayson County (Wildcat)—		
McMurray et al, Long 1	*	3929
Jack County—		
Danciger, Ivey 7	342	3235
Grace & Barrow, Bloodworth 3-A	*	345
Montague County (Bonita)—		
United Producers Co.-Continental, Langford 1, blk 47	86	2938
Throckmorton County—		
Pennell et al, Still 1, sec 936	*	430
Wichita County (K-M-A)—		
Board of Mineral Dev.-G&W Drl. Co., Big Wichita River 8	832	3760
Boller et al, Collins 2	*	3990
Consolidated Oil Co., Barnes 1-A, sec 9	1104	3997
James 5, sec 16	1032	4013
James 6, sec 16	936	3984
Gray et al, fee 1 (4.35-ac), blk 3	568	3881
Hamilton & Joe Worsham, Hamilton-Martin 3, sec 12	200	3783
Hanlon-Buchanan, Inc., Fassett-Tuttle 10-B	576	3899
King Oil Co., Wigley 7-A	768	3860
King Oil Co.-Perkins-Cullum, Pettit 15, sec 28	608	3750
Shell and Phillips, Preston 5-A, sec 20	556	4002
Ven-Mex Oil Co., Big Wichita River 8-A	672	3815
Big Wichita River 10-A	369	3817
Wichita County—		
Fisher & Dudley, Warren 4	*	814
Montgomery & Woodlief, Weaver 1	4	1107
Ven-Mex Oil Co., Big Wichita River 8-S	14	1804
Wichita County (Wildcat)—		
Westbrook Oil Corp., Ramming 1.	*	1245
Young County—		
Brazos-Young Corp., Robt. Bullock 1	*	4891
Cable Oil Co., Snider 44	*	620
Christie Bros., A. Street 3	2688	3393
Horwitz & Oldom, Green 9, sec 268	*	733
Green 11, sec 268	*	733
Long & Ray Oil Co., Bills 1, sec 1971	508	4073
McDonald et al, Jeffery 1-B, sec 52	*	900
Willis et al, Stewart 1, blk 27	*	698
Worthington et al, Heard 1, sec 78	*	1140
Routan 1, sec 266	*	813

* Failures; † Junked; ¶ Million cu. ft. gas.

East Texas Fields

Plugged wells offsetting new ones in East Texas

Kilgore.—Plugging depleted oil wells in East Texas field is progressing at sufficient rate to maintain the total wells on the official proration schedule below the peak level reached about March 1 in the face of a nominal revival of drilling. Six additional wells were listed as plugged the past week. Currently the field is credited with 26,012 wells, including 194 dormant producers. There are 17 field operations, with majors accounting for 11 of the total.

Engineers have been unable to fully account for the previously reported decline of between 15 and 17 pounds in the average reservoir pressure during April, except for the restoration of production on a 6-day week basis. The loss is not expected to be so severe when the routine survey of key wells is made late this month, as bottom hole pressures usually level off after taking a sharp drop.

Large gasser completed in new sand at Waskom

Shreveport.—Arkansas Fuel Oil Company's Davis 1, James Adams Survey, Harrison County, Texas, Waskom district, was completed gauging 5,040,000 cubic feet of dry gas daily after casing was perforated at 5970-6000 feet and from 6150 to 6185 feet in basal Glen Rose lime (Pettet). Depth was 6200 feet. The company immediately staked location for another operation to go to the same depth, heretofore not productive at Waskom. The new test is Abney B-1, J. J. Blair Survey, ¾-mile east of the same company's Abney 1 that 1½ years ago blew out from upper Glen Rose and was out of control for a time.

Paul Pewitt is moving in seven-inch casing at Rushing 1, Mannan Smith Survey, Panola County wildcat which is in the Glen Rose or near it around 5500 feet, with the test drilling "tight." Pewitt recently acquired controlling interest in McDaniels and associates' south outpost test at Joaquin, Shelby County, and is trying to get lease owners in the W. R. Childers and W. H. Clark Surveys between this outpost and the field proper to unitize acreage for a series of tests.

Carthage, Texas.—Turner and Smith have ordered pipe for J. W. Bird 1, George Gallaspie Survev Panola County wildcat, which blew out making a large amount of gas from 4985 feet in Glen Rose lime. The flow was killed and decision made to set casing. With elevation of 279 feet, the test logged base of massive anhydrite at 4870 feet.

East Texas Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Joiner Area—		
Arkansas Fuel Oil Co., Beall 13 (79.47-ac)	7000	3672
Kilgore Area—		
Cities Service, Leverett 17 (87-ac)	7200	3786
M. W. McVey et al, Baptist Church 3, lot 5	250	3580
Rudco Oil & Gas Co., Sexton 5 (20-ac)	120	3647
P. F. Rutledge & Bohn, State Strip 2	1200	3575
Longview Area—		
Bohler & Rutledge, Lee 1 (2.13-ac)	1800	3573
Cushing Drl. Co.-Joe Long, Owens 28-A (208-ac)	1500	3596
Roane Pet. Co., R. B. White 2	3000	3513
Shell (was R. G. Trippett), Harris 23-A	2500	3515
Angelina County (Wildcat)—		
K. L. McHenry et al, Russell 1	3	1032
Franklin County (Talco)—		
Humble, Penn-Humble 6 (700-ac)	*	4342
Henderson County (Wildcat)—		
Dulop Oil Co., Cornelius 1	*	4300
Navarro County—		
Sitton et al, Fortson 1	¶1/10	628
Titus County (Talco)—		
Humble, Phillips Bros. 1 (51-ac)	149	4355
Trinity County (Wildcat)—		
Shirley et al, Southern Pine 1	*	1208
Harrison County (Waskom)—		
Arkansas Fuel Oil Co., Davis 1, James Adams Survey	¶5	6200

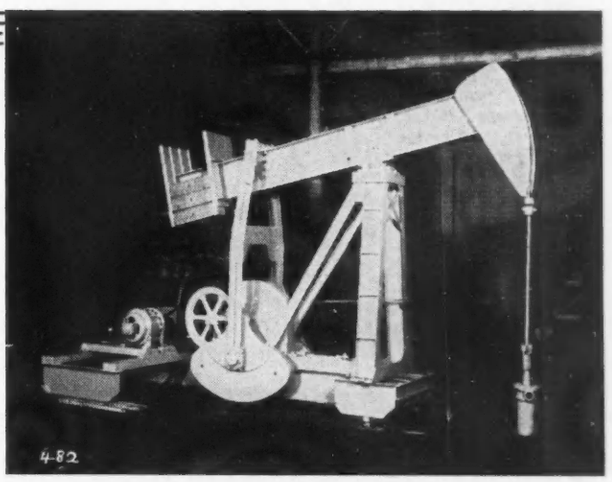
* Failures; † Junked; ¶ Million cu. ft. gas.

Aldine spacing 20 acres

The Texas Railroad Commission has issued an emergency order providing for 20-acre spacing for wells in the new Aldine field, Harris County. No permits to drill on smaller tracts will be considered unless the operator can show he has made a bona fide attempt to pool with a larger lease.

As much as 30 acres may be assigned to one well for proration purposes, but only the amount of acreage contained in the proration unit may be assigned to a well, whether it is a fractional unit or not.

At the same time the commission announced a hearing for May 25, at Austin, when evidence will be taken upon which to base permanent rules for the field.



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Southwest Texas Fields

Vicksburg sand furnishes new field near Ben Bolt. Fourth sand found in Richard King, Nueces County.

Corpus Christi.—This district's new wildcatting campaign continues to prove highly eventful with Jim Wells County adding another oil field and Nueces County receiving a new sand in one area and a probable oil field in another. The first three months of the year had been slow from a discovery point of view, but after April 1, the campaign gained momentum.

Jim Wells County's latest is Bridwell Oil Company's W. W. Smith, 1½ miles southwest of Ben Bolt, which has a Vicksburg sand section 5231-51 feet. The zone showed 17 feet of good sand and the test is bottomed in sand. Electrical log and core records show excellent porosity and good saturation. Some reports, however, state that a light show of salt water was encountered near the bottom of the hole. On a drill stem test of the top nine feet of the pay, using ¼- and ⅜- inch chokes, 1080 feet of 41.5 gravity free oil was recovered under 15 0pounds working pressure in 12 minutes. Pipe was landed on bottom.

The discovery is located near the northwest corner of a 676-acre tract in La Trinidad Grant. It is west of tests drilled by Richardson Petroleum Company and Earl Callaway, both of which showed oil and gas. The structure, on the basis of these showings, has been the center of interest for more than a year and fancy prices have been paid for leases.

Pharr Drilling Company et al's W. K. Hoffman 1 in the Springfield townsite and discovery of the Camada field of Jim Wells County, flows at the rate of 35 to 40 barrels of 46 gravity crude per day through small choke. Perforations had been made at 5628-33 feet. Two wells have been commenced on the prospect. H. H. Howell is drilling near the northwestern corner of the townsite in which the discovery well is located. Tom Graham has commenced a test 5800 feet to the northeast of the discovery on a Magnolia Petroleum Company farmout.

Ike Howeth and Lewis Production Company's R. Adams 1, east offset to the West Alfred discovery in Jim Wells County, found the sand at 4683-89 feet and set casing. Running 55 feet lower than the discovery, Lonnie Glasscock's R. Adams 1, to the southeast, found sand at 4717 feet carrying salt water and is coring ahead.

Southern Minerals Corporation opened a fourth sand in the Richard King area of Nueces County with Richard King 1-B, Section 30. The well found the new sand at 5215-28 feet in the Frio, but was drilled to 5419½ feet, in sand topped at 5398 feet. The latter sand recently was discovered by the company, but has only one producing well. Casing was landed on bottom and the new zone tested through perforations at 5217½-27½ feet. On a drill stem test, the well recovered 125 feet of mud, 770 pounds pressure through ¼- and ⅜-inch chokes in 17 minutes. Bottom hole pressure was registered at 2420 pounds. Holes were squeezed and new tests will be made in the regular pay.

Seaboard Oil Corporation of Delaware drilled to 7440 feet and ran electric logging device in LaPrelle 1-A, discovery well of a new field to be known as the North Luby field of Nueces County. The hole was plugged back and 5½-inch pipe landed at 4370 feet. It will be completed through perforations in oil sand 4347-61 feet, where previous drill stem tests indicated a commercial producer. The well is one mile north of the present Luby field production, but on a separate structure.

Refugio County producing properties of Humble Oil & Refining Company and Quintana Petroleum Corporation were further increased through acquisition of Copano Oil Company's 786½ acres in Melon Creek field. The deal involved the company's discovery well and four other producers. The Humble-Quintana group now controls all of the properties on the structure. The deal brought a cash consideration of $250,000, plus other obligations.

J. O. Nelson, Tandy C. Young and R. J. St. Germain have let contract for a 6000-foot wildcat about 1¼ miles south of Magnolia Petroleum Company's West Ranch production in Jackson County and work will commence immediately. The well is important as its completion as a producer would place a number of companies in line for development in this prolific 5100-foot district. Magnolia has been drilling a row of tests in the field, extending its producing limits to two miles in width, east to west.

Francitas Disappointing

Jackson County's other active deep field, Francitas, does not look too good with salt water showing up in several wells. Mills Bennett's Lowrance 1, is waiting on orders after testing salt water through perforations at several levels above 9030 feet. Wynn Crosby's Kopnicky 1, apparently opening a 7900-foot sand, tested almost all salt water through a series of perforations in the same level. Housh & Thompson's Broughton 1, had made several squeeze jobs and will attempt completion in sand at 7396-7404 feet, where an oil showing was encountered.

Rumors persist that The Texas Company will soon announce plans for drilling a 9000-foot Sparta-Wilcox test on the Fordtran block in northeastern Victoria County. One shallow gas well has been completed on the structure. Reworking the area with geophysics, the company is said to have uncovered a "Class A" type Sparta-Wilcox structure.

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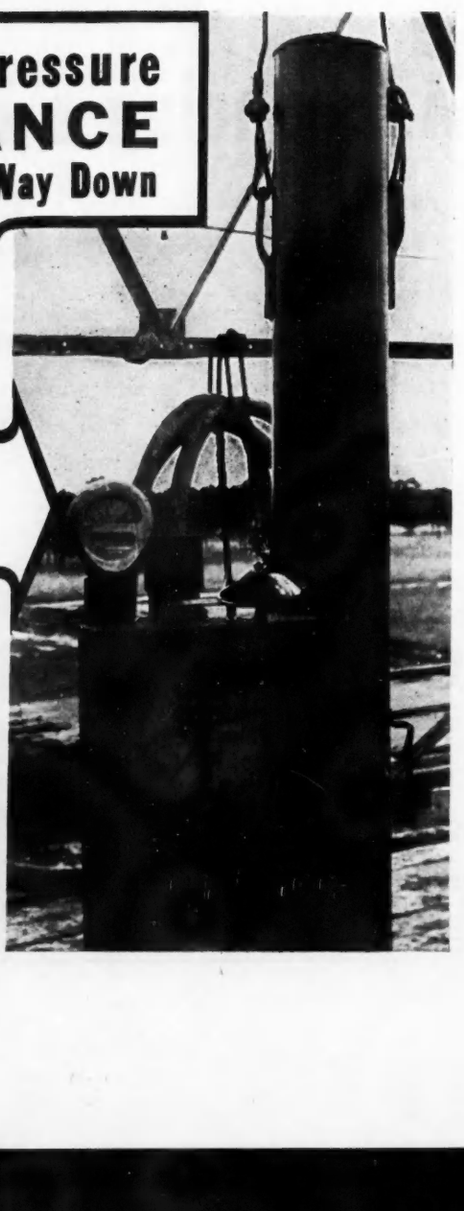

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Starr County gets new field and two extensions

Mission.—Starr County appears to have one new field in the making with two others receiving major extensions. These operations further expand an already active program in this sector of the Rio Grande Valley.

Whitfield and Souther's Bennett and Carruth 1, Tract 182, Porcion 90, two miles east of the Barbacoas area, found a series of gas sands from 1900 feet to below 2800 feet, where it is now being cored. All of the sands carried gas, but it is believed that there was a distillate content in several of the zones. On a drill stem test at 2497-2513 feet, the only test made, a good gas blow was recovered during the first five minutes. The tool was to have been closed to register the pressure, but it slipped and the valve was reopened for 10 minutes. Gas continues to blow, but when the pipe was pulled, 1100 feet of mud with an oil odor were recovered. Bottom hole pressure was checked at 1300 pounds.

The above well is on a magnetic prospect.

Transwestern Oil Company and Rowan & Hope's Cameron 1, Section 228, 2 miles northeast of Rincon field, bottomed at 4216 feet and was drilling plugs. The well found an oil sand at 4154-73 feet, but the hole is expected to be drilled ahead to lower sands before plugging back and completing in the above level. It may open the first crude production for the Rincon field new sand.

Magnolia Petroleum Company's Garcia 1, about 2 miles northeast of the Barbacoas field, was at 6529 feet and likely will be carried much deeper. The test has had several gas showings and attempted once to blow out of control.

In an effort to extend the Ricaby field about 3300 feet to the north, Bishop and Moss are completing Ricaby 1, which has sand at 1294-1305 feet. It is showing considerable oil.

Sal Vieja Oil Corporation and Pure Oil Company have commenced their first of three 10,000-foot slim holes on a huge block in southern Cameron County, east of Brownsville. The first test will be in Share 3, San Matrin Grant, Esperson Estate. Falcon Seaboard Drilling Company has all of the contracts.

Too much gas flow in Duval County discovery

San Diego, Texas.—Excessive flow of gas apparently is overcoming the oil volume in J. B. Blanchard et al's Pettus sand discovery in Section 298, several miles southwest of the Thomas-Lockhart field, Duval County. The well, Atlee Parr 1, cored a cap at 4710-12 feet and a saturated sand at 4712-15 feet. Casing was landed at 4710 feet.

Latest gauge on the producer gives it 45 barrels of 42 gravity oil per day through 3/32-inch choke under pressures of 1500 pounds on casing and excess of 1000 pounds on tubing. The tubing gauge had a maximum register of 1000 pounds and the needle had reached the top point. The well showed a little salt water when drill stem test was made, but upon completion, it made clean oil.

A shallow pool apparently has been uncovered in the extreme northeastern corner of Webb County in Gordon Johnson et al's Mabel Adami 1, 660 feet out of the SEc NW Section 345, about 1 mile from the north and east lines of the county. It found Mirando sand 992-99 feet and casing was set at 989 feet. The test bailed down, but could not lower the fluid level below 400 feet. Pumping unit was being installed, the well apparently good for 30 to 35 barrels per day on artifiicial lift.

Well on Maetze structure gets oil and salt water

Beeville.—Establishment of the first crude oil production on Maetze structure in Goliad County is apparent with H. J. DeArman, Winward Oil Company and Cron and Gracey testing O. G. Drier 2, in Survey No. 7. The well found an oil sand at 5551-70 feet in Yegua zone, but went ahead to 5885 feet. Perforations were made 5566-70 feet with 13 shots, where salt water with some oil was recovered, and the holes were squeezed. A test will be made higher in the zone.

The above well found sands showing gas at 4600-40 feet, 5290-97 feet, 5379-89 feet. Oil sands were encountered 5551-70 feet and 5760-72 feet.

Bastrop County wildcats may revive fault drilling

San Antonio.—Bastrop County may prove the key to reviving interest in wildcat exploration along the Balcones fault line. One wildcat was in final stages of completion, while another was waiting orders to test.

V. A. Hughes and Company's O. B. Lentz 1, in the Freeman Wilkinson Survey No. 21, at the town of Red Rock, is preparing to test on pump. The well found Dale lime with oil show at 2348-68 feet, dry serpentine at 2373-80 feet and is bottomed at 2460 feet in Austin chalk. Storage is being erected and pumping equipment installed before final completion. The test is north of the North Dale field and is south of production in the Hilbig and Carrol areas. It is not expected to cover a large area, but likely will be similar in proportions to the other pools in southern Bastrop County.

Plan two recycling plants in Southwest Texas fields

San Antonio.—Construction is expected to start soon on two recycling plants in the lower Gulf Coast of Texas. One plant will be in East Alice field, Jim Wells County, while the other is generally understood to be planned for the north end of Stratton structure, Nueces County.

R. B. Bryant will process production from the 4700 and 5200-foot distillate sands at East Alice and recycle the residue gas. Plans for the project have not been made public, but it is understood that the unit will cost in the neighborhood of $500,000 and will handle a minimum of 50,000,000 cubic feet of gas per day.

Texon Royalty Company, which controls several thousand acres of leases immediately north of the Corpus Christi Corporation's production in Stratton, entered that area several days ago with three locations to be drilled to 6500 feet. The wells are to test the various sands, and it is understood that if they provide sufficient fluid to warrant the construction of a unit, a plant of similar proportions to the one operated by the Corpus Christi Corporation in the same field will be erected.

South Texas Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
CORPUS CHRISTI DISTRICT		
Aransas County—		
Culton, Barry 1 (McCampbell) pb 6783 ft	785	7143
Brooks County—		
Humble, McGill 9 (Kelsey)	375	4736
Goliad County—		
Ormsby, Gillette 1 (WC) N. Pettus	*	3908
Hidalgo County—		
Fohs, Sheldon 1 (WC) Samfordyce	12	4170
Jackson County—		
Magnolia, West A-10 (West Ranch)	1000	5137
Porter, Drushel 4 (Cordelle)	500	2738
Jim Wells County—		
Atlantic, Bankers Mortgage 1-B (E. Alice)	400	5369
Graham, Bankers Mortgage E-5 (E. Alice)	450	5393
Zappe 1 (E. Alice)	50	4680
Irwin, Garcia 1 (WC) sec 102, Magnolia City	*	5468
Nueces County—		
Sinclair Prairie, 4-X (Saxet) Isensee	150	5810
Refugio County—		
Coronado, Rooke 14 (La Rosa)	500	6365
Rutherford, Jurica 1 (WC) Woodsboro	*	6513
Houston, Rooke 21 (Refugio)	550	6235
Quintana, Heard 6 (Tomoconnor)	2650	5925
O'Connor 16-C (Tomoconnor)	2350	5924
San Patricio County—		
Benedum and Martin, Scevers 1 (McCampbell)	1100	7156
Bryant, Stockton 1 (McCampbell)	1050	7167
Losoya 2 (McCampbell)	1200	7160
Grote & Corgey, McCampbell 8 (McCampbell)	1200	7150
Plymouth, Brooks 3 (East White Point) pb 4015 ft	10	8383
Cole 2-B (East White Point)	450	5673
Solar & Ficke 3 (East White Point)	500	5677
Sinclair Prairie, Womack 4 (East White Point)	500	5670
Welch, Fee 3 (East White Point)	500	5677
Victoria County—		
Gulf, Keeran 15 (Keeran) pb 5940 ft	200	7007
Houston, Fagan 2 (McFaddin) pb 5300 ft	¶5	6000
Transwestern, McFaddin E-12 (McFaddin)	300	4417
Willacy County—		
Andrade, Yturria 1 (WC) La Sal Vieja	*	7714
SAN ANTONIO DISTRICT		
Bexar County—		
Schreiner, Avant 1 (WC) George T. Dunn sur	*	lcn.
Noake, Oppenheimer 1 (WC) Miller sur	¶⅛	1008
Philtop, Patton 6 (Mission - Alta Vista)	*	1522
Bastrop County—		
Jourdan, Lawhon 1 (WC) E. Standifer sur	*	2070
Caldwell County—		
McNeill, Huff 1 (WC) Seal League	*	2688
Ogden, Dinges 3 (West Dale)	*	2455
Medina County—		
Cromwell, Mangold 1 (Chicon Lake)	*	1297
LAREDO DISTRICT		
Duval County—		
Dutex, State 7 (Piedre Lumbre)	425	2065
Gravis, Parr 1 (2) (WC) San Andres Grant	*	6143
Humble, DCRC No. 3-E (202) (Eagle Hill)	248	2116
Keller, Gruy 1 (WC) Rancho Solo	*	2796
Lanning, Noake and Evans, Peters 10 (Rancho Solo)	*	lcn.
Magnolia, DCRC 18 (291) (Casa Blanca)	*	1254
Magnolia, DCRC 7 (189) (Cedro Hill)	¶15	1487
DCRC 24 (201) (Eagle Hill)	300	2168
Well 34 (Hoffman) pb 2705 ft.	¶8	2828
Miller, Miller 6 (Longhorn)	350	4903
Sun, Brueggemann 14 (Fitzsimmons)	500	4296
Jim Hogg County—		
Humble, Bass 13 (Kelsey)	350	4739
McMullen County—		
Jones, Ezzell 73 (Ezzell)	19	1564
Ezzell 83 (Ezzell)	37	1558
Ezzell 89 (Ezzell)	44	1548
Ezzell 91 (Ezzell)	61	1529
Starr County—		
Sun, McKinney 5 (Sun)	10	5120
Webb County—		
Sunerior, Walker 1 (WC) 10 mi n of Oilton	†	2334
Zapata County—		
Martinez, Bruni 1 (WC) 14 mi s Aguillares	¶2	450
Buffalo, Hinnant 8-A (Mirando Valley)	85	1993
Hinnant 6-B (Mirando Valley)	36	1850

* Failures; † Junked; ¶ Million cu. ft. gas.

Texas Gulf Coast

Prison farm land wildcat makes 13 barrels hourly. Second well at Caplen completed as good producer.

Houston.—A new oil field was indicated for this area last week when Hamman Exploration Company's Darrington State Prison Farms 1, A. McFarland Survey, northwest of Sandy Point field, Brazoria County, came in flowing 13 barrels per hour before shaling up. Little information is being given out on the wildcat, but reports are that the hole was drilled to 8917 feet and that casing was perforated around 8200 feet. On a drill-stem test with packer set at 8200 feet the wildcat flowed 120 barrels in 12 hours, 39-gravity oil through a 3/16-inch choke, it is said. Later the well shaled up and perforations were squeezed with cement for another test. Hamman Exploration Company discovered the South Bay City field, Matagorda County.

First Twin at League City

The first twin well to be completed at League City field, Galveston County, is Geo. Echols' Ross-Stewart 4, Perry & Austin Survey, on the same 20-acre tract at Ross-Stewart 2, which was completed at 9230 to 9260 feet. Ross-Stewart 4 was perforated with 76 shots from 8683 to 8702 feet and came in flowing an estimated 10½ barrels of oil per hour through a quarter-inch choke. Tubing pressure was 2750 pounds and casing pressure was 3150 pounds.

Sun Oil Company made a potential test on its second well at Caplen field, Galveston County, last week. Hudnell et al 1, S. F. Hughes Survey, flowed 703 barrels of fluid daily, (667 barrels of 30.3-gravity oil), through a quarter-inch choke with a tubing pressure of 1000 pounds and a casing pressure of 1290 pounds. The well was perforated at 7388 to 7404 feet. The company also made location for a wildcat in East Bay, Galveston County; State 1-179 is 2400 feet northwest of southeast line of Section 179 and 4600 feet northeast of northwest line of same section.

Flank Test Producers

General Crude Oil Company's Fee 2-B, southeast flank test at Esperson, Liberty County, which logged a new sand the previous week, was given a production test and flowed 510 barrels of 40.3-gravity oil daily through a quarter-inch choke with a tubing pressure of 720 pounds and a casing pressure of 1700 pounds. The well was perforated with 24 shots from 7000 to 7015 feet.

On the Algoa prospect, Brazoria County, Wynn Crosby's Wilson 1, A. G. Reynolds Survey, was abandoned last week at 10,497 feet in shale. The wildcat indicated it would open an oil field some time ago when a test at 9495 feet showed salt water with a trace of oil. Crosby is preparing to drill another wildcat.

On the south flank of Manvel, Brazoria County, Brown & Wheeler's Callihan 1, J. O'Donnell Survey, cored salt water sands at 5645 to 5655 feet, 5710 to 5720 feet and from 6270 to 6275 feet. The hole, down to 6505 feet at the close of the week, was waiting on orders.

Another failure for Mt. Houston prospect, Harris County, was reported at Jack Frazier's L. E. Griffith 3, drilled to 4079 feet. Sand with an odor of oil and a salty taste was cored at 4071 feet.

H. E. Williams & Gillespie's second well, north of Satsuma field, Harris County, was being swabbed for a production test. Behne 2, W. C. R. R. Section 2, Block 1, was drilled to 6857 feet and oil sand was cored from 6834 to 6845 feet. Casing was perforated with 12 shots from 6838 to 6842 feet.

Smith Point Failure

Housh & Thompson's Robbins 1 on the Smith Point prospect, Chambers County, E. T. Branch Survey, was abandoned in Frio formation at 9512 feet. All sands showed salt water. The main sand was logged at 8956 feet.

Plymouth Oil Company will attempt to establish production on the old Robinson Lake prospect in Chambers County. Location was staked for Wilburn 1, 1172 feet south and 1165 feet east from the northwest corner of Wm. Moore Survey, Abstract 185.

In the Glen Flora area, Wharton

Texas Gulf Coast Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Anahuac—		
Humble, Johnson 29	711	7142
Blue Ridge—		
F. M. Long, Lusher-Gulf 1	425	4465
Cedar Point—		
Standard of Texas, State 56-94	*	6950
Damon Mound—		
Wilkinson et al, Munson 1	*	1830
Danbury—		
Smith & McDannald, Haury 2	*	3512
Fairbanks—		
Stanolind, Jahnke 2	135	6846
Friendswood—		
Humble, Beamer 10	617	6048
West-Fee B-27	590	6045
West-Herman Hospital 2	601	6048
Hardin—		
Humble, Partlow 2-B	438	7580
Hastings—		
Stanolind, Autrey 10	615	6060
Moore C-12	625	6078
Katy—		
Magnolia, Allsup Estate 1	¶2	7386
Manvel—		
C. Olsen, Stitt 1-A	350	3982
Markham—		
Hamil & Hamil, Myers 3	15	3887
Myers 5-B	265	3858
Orange—		
Union Prod. Co., Lutcher Moore 5	*	6940
Port Neches—		
Texas Co., Kuhn 14	185	5936
Segno—		
Gulf, Wing 18	631	8102
Silsbee—		
Humble, Kirby 3	115	6838
Tomball—		
Amerada-Stanolind, Juergens 2	481	5586
Withers—		
Smith & McDannald, Macomber-Broussard 1	114	5547
Texas Co., Broussard 9	112	5545
Brazoria County—		
Wynn Crosby, Wilson 1, Algoa area, A. G. Reynolds sur.	*	10,497
Chambers County—		
Housh & Thompson, Robbins 1, Smith Point area, E. T. Branch sur	*	9512
Harris County—		
Jack Frazier L. E. Griffith 3, Mt. Houston area, W. Britton sur.	*	4079
Waller County—		
M. K. Culver, Dodd 1, se of Hempstead	*	1740

* Failures; † Junked; ¶ Million cu. ft. gas.

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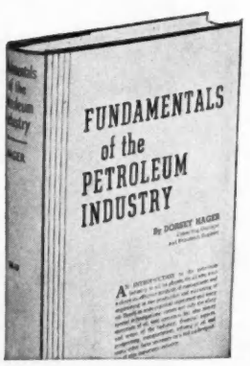

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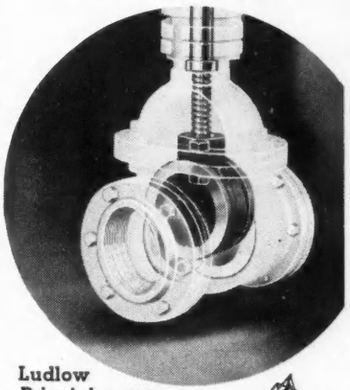

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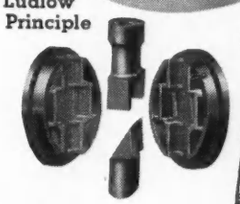

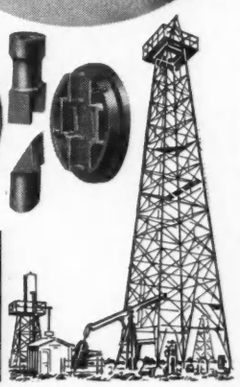

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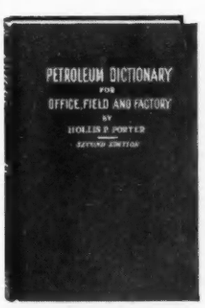

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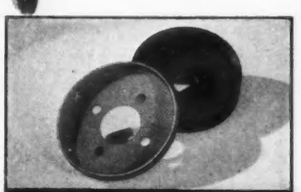

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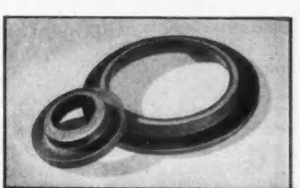

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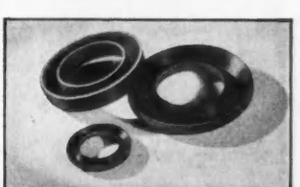

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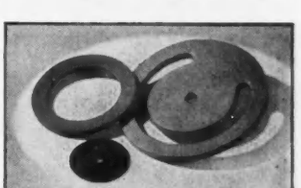

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County, Cockburn et al's Hamburger 1, was drilling in shale at 4500 feet last week. The well is reported to be higher than other wells drilled in the area. The Discorbis was logged at 3950 feet and Heterostegina at 4030 feet. Elevation is 119 feet.

O. C. Garvey's Foster Estate 1, the first Wilcox test in the Willis area, N. Martin Survey, Montgomery County, was abandoned at 7401 feet in shale after coring a sandy shale formation with a slight show of oil from 7002 to 7006 feet. Salt water sands were cored at 6771 to 6803 feet.

Jack Frazier and Sinclair Prairie Oil Company's Wilcox test, A. Smith 1, Sheppard area, J. Martinez Survey No. 10, San Jacinto County, was coring ahead in shale at 5239 feet at the close of the week. Over 110 feet of salt water sand was cored from 5113 to 5239 feet. A broken salt water sand was cored at 4095 to 4431 feet.

East of Richmond, Ft. Bend County, Royal Oil & Gas Company and Pat Rutherford's Bertrand 1, J. Wilkens Survey, was abandoned at 6504 feet in Frio formation. Salt water sands were cored at 4803 feet.

Conoco-Driscoll hearing

A hearing to consider revision of operating rules in the Conoco-Driscoll field, Duval County, has been scheduled by the Texas Railroad Commission for May 23, at Austin.

Operating rules for the new Apco field, Pecos County, will be considered by the Texas Railroad Commission at a hearing set for May 24 at Austin.

South Louisiana

Paradis prospect wildcat yields gas and distillate on test. St. Gabrielle, Iberville Parish, shows as possible field.

Lake Charles.—A new gas and distillate field was discovered last week when The Texas Company's Paradis 1, Section 39-14s-20e, St. Charles Parish, at 10,077 feet flowed gas and distillate on production test. The company has killed the well and will rework it. Hole was drilled to 10,787 feet, and broken oil sands were cored at 10,059 to 10,065 feet. A string of 9⅝-inch casing was set at 8970 feet, and 7-inch was then set deeper. It was perforated with 17 shots from 10,055 to 10,077 feet. A 75-minute drill-stem test showed 75 barrels of distillate daily through ¼-inch chokes. Pressure was 7200 pounds, the highest ever shown on a wildcat in the Gulf Coast. Attempt is being made to shut off part of the pressure and make another test.

Another oil field may be opened by Shell Oil Company's Natalbany Lumber Company 1, St. Gabrielle area, Iberville Parish. Last week the wildcat was plugged back from 10,542 to 9100 feet and casing perforated with 17 shots from 9040 to 9045 feet. A drill-stem test attempt failed. Very little information has been given out, but it is understood that a good sand section was logged around 9000 feet. The company is reported to have purchased additional acreage in the area after coring the sand.

In the Bayou des Glaise area, Iberville Parish, Humble Oil & Refining Company has abandoned Iberville Mortgage Loan Company 1 at 10,025 feet. Cores at 9437 feet had odors of oil and salt water and oil odor at 9747 feet.

About 1800 feet east of production at Eola, Avoyelles Parish, Sun Oil Company is preparing to complete Townsend 1, which cored Wilcox oil sands at 8543 to 8568 feet and set 5½-inch casing. About 3100 feet east of production at Eola, Gulf States Oil Company's Haas 1 was drilling in shale at 6550 feet after topping the Vicksburg at 5840 feet. It is running about 20 feet lower than the discovery well. Sid Richardson has completed another well on the southwest side of the field, Haas Investment Company 4, which flowed 460 barrels of oil daily, no water, through ¼-inch choke, with tubing pressure of 1100 pounds and casing pressure of 1500 pounds. Casing was perforated from 8496 to 8525 feet. A mile southwest of production at Eola, Magnolia Petroleum Company is reported preparing to make its first location in the area, on the L. Campbell tract in Section 18.

Bel Oil Company recovered salt water again in Bel Estate 1, North Elton prospect, Allen Parish. Casing was perforated at 6917 to 6919 feet and a 30-minute drill-stem test showed salt water. Perforations have been squeezed and retainer set at 6004 feet.

George Echols has entered the Baton Rouge field, East Baton Rouge Parish,

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South Louisiana Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Charenton—		
St. Mary Oil Co., LeBlanc 1	75	1130
East Hackberry—		
Stanolind, Gulf Land B-23	*	5931
Garden Island Bay—		
Texas Co., State 33	475	6630
Golden Meadows—		
Mar-Tex, Falgout 1	250	7955
Jennings—		
Rock Oil Co., Martin 10	*	1780
Lake Pelto—		
Texas Co., State 24	129	5068
Potash—		
Humble, Orleans Levee Board 38	418	8060
Sulphur—		
Union Sulphur, Fee 835 (wo)	*	4704
Villa Platte—		
Continental, P. McDaniel 1	432	9082
Woodlawn—		
Union Sulphur, Calcasieu National Bank 3	*	9290
East Baton Rouge Parish—		
Gulf States Exploration Co., Greater University Land Co. 1, e of Arlington, 48-7s-1e	*	7678
Iberia Parish—		
Texas Co., State 5, Fausse Point, Fausse Point area, 38-11s-8e	*	12125
Pointe Coupee Parish—		
Falcon-Seaboard, Hobgood 1, Pikes Peak prospect, 8-1s-7e	*	8012

* Failures; † Junked; ¶ Million cu. ft. gas.

on a farm-out from Superior Oil Company of approximately 130 acres. Locations have been made for Morgan 1 and Duplantier 1, north of production.

Falcon-Seaboard Oil Company's Hobgood 1, Pike's Peak prospect, Pointe Coupee Parish, was abandoned at 8012 feet after coring a sand in the Wilcox which showed salt water. Top of the sand was at 7249 feet.

The Texas Company recovered salt water on another test in L. L. & E. Golden Meadows, Golden Meadows field, Lafourche Parish. Last week the casing was perforated with 10 shots at 10,769 to 10,771 feet and the well flowed salt water. Perforations have been squeezed with cement for another test. This well is below the regular producing horizon for the field.

On the Pine Alley prospect, St. Martin Parish, Roper & Todd's Levert 1 was shut down. It is reported to be 200 feet higher than Magnolia Petroleum Company's dry hole in the area, and may be drilled to 10,000 feet.

Another deep wildcat on the flank of Fausse Point, Iberia Parish, was abandoned last week. The Texas Company's State Lake Fausse Point 5 was drilled to 12,125 feet and a series of tests made up the hole showed water. The last test made was from 8610 to 8620 feet, and 6000 feet of salt water was recovered.

Shreveport geologists plan annual field trip

Approximately 150 geologists, oil men and others interested in the geology and oil industry of the Ark-La-Tex area are expected to attend the fourteenth annual field trip of the Shreveport Geological Society on June 2, 3 and 4, to study the Upper and Lower Cretaceous rocks of South Arkansas and North Louisiana.

Most of the group will assemble at the Grim Hotel, Texarkana, Arkansas, the night of June 1, where a preliminary meeting will be held for a discussion of the general geological features of the area to be covered in the trip.

At 7 a.m. June 2, the party will travel by bus northward through Fulton and Dierks. On this trip a number of stops will be made to see the exposures of the Upper and Lower Cretaceous rocks. The party will spend Friday night at the Arlington Hotel, Hot Springs, Arkansas, and the group will have ample time to visit interesting locations in and around Hot Springs.

During the second day's trip, exposures of Cretaceous rocks will be studied en route back to Texarkana, where on the night of June 3 the party will again spend the night. The third day's trip will cover an area from Texarkana to DeQueen and Cerro Gordo and return to Texarkana.

Those desiring information regarding the field trip should communicate with Floyd Miller, secretary of the society, 911 Commercial Bank Building, Shreveport.

Will consider request to build recycling plant

The Texas Railroad Commission has scheduled a hearing for May 22, at Austin, on the application of R. B. Bryant to install a recycling plant in the Tom Graham field, Jim Wells County.

North Louisiana Fields

Shreveport outposts take spotlight from field. Well five miles from production running high.

Shreveport. — The Shreveport field added two wells last week to bring its total of basal Glen Rose lime (Pettet) producers to 33, had two other operations in process of completion and placed its first well on the pump. Two outpost operations, one five miles to the northeast and apparently on a separate structure, and the other 1½ miles northwest, held more interest during the week than the field proper.

Five miles northeast of the northeast producing part of the Shreveport field Harry Hanbury's Leonard 1, NE NE 19-19n-13w, Bossier Parish, drilled at 4505 feet in massive anhydrite, topped at 4050 feet, 110 feet higher than this contract's mean depth in the Shreveport field. Elevation is 188 feet. One and one-half miles northwest of production, J. Thomas Driscoll's Woolworth 1, NE SE 19-18n-14w, started coring for the Pettet (basal Glen Rose) lime at 5550 feet. Elevation is 196 feet. Top of first anhydrite was 4135 feet and top of massive was 4410 feet.

Cotton Valley Extended

The fourteenth oil well for the lower Marine at Cotton Valley, Webster Parish, extended oil production in that horizon 1320 feet east in Mid-States Oil Company's T. K. Giddens 1, SW SW 30-21n-9w, which flowed 260 barrels in first 12 hours through quarter-inch choke with 980 pounds tubing pressure and 1000 pounds casing pressure. The Cotton Valley lower Marine also accounted for a gas-distillate well during the week.

Arkansas Fuel Oil Company's Gayoso 2, C SW SE 14-16n-10w, Bienville Parish, cored ahead below 8311 feet, to which point electrical log was run. This test topped lower Marine at 7850 feet and logged porous to slightly porous sand with a small showing of gas and distillate at 8139-60 feet; elevation is 188 feet.

Two outpost tests in the Vivian offshoot of the old Pine Island field, Caddo Parish, cored for the lenticular Tokio and Paluxy horizons of that area last week. W. F. Bridwell's Huckabay 1, Section 19-22n-15w, cored in hard sandy lime at 2450 feet, and one mile outside production there F. W. Martin and Company's Bailey 7, NW SW 29-22n-16w, cored at 2557 feet after a slight showing of oil and gas in a core at

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2544-46 feet. Despite a large percent of failures along with producers, seven rigs are in operation in this area.

Deepest operation in North Louisiana, Union Producing Company's Walker Unit 1, C SE 30-18n-8w, Webster Parish, at Sibley, drilled hard sand shale at 9850 feet May 18. Standard of Louisiana's and Joe Modisett's Frost Lumber Company B-1, SE SE 14-23n-2w, Union Parish, on a geophysical prospect, drilled red and gray sand with streaks of sandy lime at 7728 feet. This test showed some dead oil between 6995 and 7008 feet, in the lower Marine, topped at 5800 feet. Elevation is 155 feet.

The Walker Unit of Union Producing Company at Sibley is still in the Travis Peak at 9850 feet, signifying this section has thickened materially as compared to Cotton Valley, where it is generally less than 2200 feet thick. In the Union Producing Company test this marker was picked up at 6910 feet. Elevation is 256 feet.

North Louisiana Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Caddo Parish (Pine Island)—		
C. C. Lowery, Collins et al 1, 7-20n-15w	75	1580
Caddo Parish (Pine Island-Vivian)—		
Tippett Oil Corp., Huckabay 1, 26-22n-16w	*	2545
Bachellor, Birdwell et al, Van Horn 1, 22-22n-16w	90	2656
Burnham Drilling Co., Tom Bell 2, 34-22n-16w	*	2493
F. W. Martin & Co., Van Horn 1, 22-22n-16w	*	2792
Caddo Parish (Shreveport)—		
Hurricane Pet. Co., DeSoto Corp. 1, 26-18n-14w	481	5560
Lisbon-Iberia Oil Co., Morgan 1, 34-18n-14w	384	5614
Claiborne Parish (Homer)—		
Maritzky & Bibby, McClung 2, 29-21n-7w	10	1460
La Salle Parish (Wildcat)—		
Adams O&G Co., Goodpine Oil Co. 1, 1-6n-2e	*	2700
Webster Parish (Cotton Valley)—		
Hunt Oil Co., Bodcaw-Stewart 5, 33-21n-10w	267	8347
Mid-States Oil Co., T. K. Giddens 1, 30-21n-9w	520	8630

* Failures; † Junked; ¶ Million cu. ft. gas.

First Pumper in Field

The Shreveport field saw its first basal Glen Rose lime well go on the pump last week at C. H. Lyons' McFadin 1, NW NW 3-17n-14w, southwest edge well that has shown water since soon after completion.

Another wildcat test for the Wilcox horizon in LaSalle Parish is in prospect before October 1, the spudding date set for a block of 2500 acres assembled around Sections 35 and 36-9n-2e by Petersen Petroleum Company of New Orleans. This area is in the northern end of the "Eola trend" and just south of the Angelina-Caldwell flexure. In the same parish and in the same township and range Atlantic Refining Company has a seismograph unit at work. South of the shallow Urania field that produces from the Claiborne-Wilcox contact at 1500 feet, Standard Oil Company of Louisiana has a gravimeter unit making profiles of LaSalle Parish and of Catahoula Parish, which joins it.

In the same general "trend" and in Concordia Parish around Section 9-8n-9e, McDaniel and Cory of Houston have secured a geophysical option on approximately 10,000 acres and if selection is made they will drill a 7000-foot test.

Plan Joint Test

With the support of several companies owning acreage in the vicinity, Ryan and Andrews are expected to start by July 1 on a 6500-foot wildcat test that must go to that level or 300 feet into Travis Peak. Location is to be in C NW SE 5-11n-14w, DeSoto Parish, 10 miles east of Logansport. Shell Oil Company is taking acreage in the block. This company has core drilling units in two north Louisiana parishes just north of the Angelina-Caldwell flexure, one in Townships 15 and 16 north, Range 1 west, Jackson Parish, where it recently had a soil analysis unit at work, and the other in southern Sabine Parish, in Township 4 north, Ranges 11 and 12 west.

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Arkansas Fields

Second Glen Rose producer is indicated for Stamps

El Dorado, Ark. — Indications were given last week that the newly discovered Stamps field, LaFayette County, which has one well producing from the Glen Rose below anhydrite, would add its second well at Erwin, Leach and East Texas Refining Company's Bell Estate 1, NW NW 19-16-23. This well flowed 50 barrels of oil in four hours and was then shut in. Depth is 3477 feet and the last 20 feet were red and green shale. Porosity was logged from 3378-88 feet and from 3423-35 feet. These are the sections being tested just below the base of massive anhydrite. The discovery well, owned by the same operators, produces from the Hill horizon of the Glen Rose series. This well on the last 24-hour gauge made only 46 barrels and will be standardized.

Tide Water Associated Oil Company and Seaboard Oil Corporation's J. A. Price 1, C NE SW 15-18s-19w, second producer in Atlanta field, Columbia County, was being re-tested Thursday after plugging back from 8237 feet, drilling out to 8231 feet and perforating with 30 shots at 8227-30 feet. The well, which first gauged 262 barrels of oil in 24 hours, later dropped to 205 barrels of fluid daily, of which 30 percent was salt water.

Phillips Petroleum Company's Askew Unit 1, C NE NW 4-17-21, Columbia County geophysical wildcat, topped Permian lime at 8036 feet, and was coring ahead in lime at 8056 feet. Elevation is 287 feet and top of the Permian had been expected between 7900 and 8000 feet from the shooting picture. Top part of the Permian showed some porosity but no saturation.

Oliphant Oil Company's Union Sawmill 1, NW SW 22-19s-14w, Union County wildcat, showed shale and sand without oil or gas in a core at 7620-29 feet. Elevation is 158 feet.

Water level was definitely established in Shell Oil Company's Glascow 1, C SW NW 23-17s-20w, Columbia County, Magnolia field, at 7691 feet. This test went to 7708 feet to determine the water level. It took in 182 feet of saturated Permian lime. The electrical log showed top of the Permian lime at 7418 feet and top of the porosity at 7470 feet. Elevation is 368 feet.

Amerada Petroleum Corporation made location for its long-awaited Permian lime wildcat on a geophysical prospect in Bradley County.

In Little River County, Clark and Melat were drilling plugs in Strawn 1, SE SW 17-10s-32w, a wildcat, in seven-inch casing set at 1590 feet. Total depth is 1598 feet and tests will be made of reported oil shows at 1365-70 feet, and 1542-70 feet. Elevation is 320 feet.

Arkansas Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Clark County (Wildcat)—		
J. B. Zick, Tr., A. P. Greene 1, 21-8-18	*	1248
Nevada County (Troy)—		
Berry Asphalt Co., Grove L. & T. Co. 1, 4-14-20	30	1213

* Failures; † Junked; ¶ Million cu. ft. gas.

California Fields

Another wildcat play starts south of Coalinga Nose.

Long Beach has busy drilling campaign under way.

Los Angeles.—A new Coalinga wildcat play south of the Nose, is being launched. This play embraces from 20,000 to 30,000 acres. Continental Oil Company has picked up the Lillis & Welch ranch holdings; General Petroleum has leased a considerable area of Sections 4, 10 and 8-22-16 which is supposed to be on the pivot where the nose swings back to the southwest and west. As at Kettleman Hills and Coalinga Nose, Standard Oil Company of California owns alternating sections in fee. Superior holds approximately 80 acres of Section 28-21-16 in this play and a number of other operators such as Signal Oil & Gas Company, Bandini Petroleum Company, Caminol Company and Sunset Oil Company have leased portions of Section 2-21-15 and Section 12-21-16.

In the Amerada area of the Coalinga Nose three new drilling projects are following the discovery wildcat. Bandini Petroleum Company is rigging up to start No. 48-18-B, ½ mile west of the discovery hole. Between Bandini Petroleum Company and Amerada Petroleum Corporation holdings Union Oil Company is grading the site for a derrick. Northeast of its discovery well Amerada has finished the foundation for a second well, No. 26-17, and is putting up the derrick. Bandini has made a tentative location for its second drill job, but will not begin on it until its first well is completed.

Having brought in KCL 11-17 in Section 18-29-26 for an initial production of 6390 barrels per day of 34.5-gravity cutting 0.1 percent from a depth of 11,517 feet, Standard Oil Company of California has slated two more wells to be drilled in Greeley. No. 19 will be drilled across the section line from the discovery well on Section 18-29-26, and No. 20 will be drilled on Section 20, north of the prolific Fleishauer lease. Both, considered in proven territory, will go to the Vedder sand.

The Long Beach Oil Development Company lost no time in drilling the first 12 wells called for by the first part of its drilling program. Seven are drilling and 5 rigging up. Contracted to do the drilling are Pike Drilling Company, Brown Drilling Company, D. W. Elliott, and Dunlap, Fadler &

California Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Los Angeles County (Montebello-West)—		
R. R. Bush Oil, Olds 1	720	7191
Union, Wilcox 2	416	7160
Wood Callahan Oil, Harris 1	1500	7576
Los Angeles County (Torrance)—		
Lone Star Dr. Co., No. 2	300	5170
Shadle Pet. Corp., Kettler 1	150	5160
Los Angeles County (Torrance Extension)—		
General, Poggi 13	72	5192
Los Angeles County (Wilmington)—		
Security Dr. Co., No. 3	200	2880
Union Pacific, U.P. (LB) 106	708	4078
V.R.G. Wilbur, Santa Fe 2	115	3696
Orange County (Seal Beach Area)—		
Union, Nieto 1, s w nec 12-5-12 (W)	*	7101
Kern County (Belridge)—		
Richfield, Belridge 1A, n e swc 22-27-20	360	8538
Kern County (Fruitvale)—		
Western Gulf, KCL-Bellevue 1, s w nec 34-29-27	80	3931
Kern County (Greeley)—		
Standard, KCL 11-17, n w sec 18-29-26	6390	11517
Kern County (Kern River)—		
Hast Oil Co., Kern 5, n w s¼c 34-28-28	7	510
Kern County (McKittrick)—		
Freeman E. Gates, Laymance 2, n e c 20-30-22	¶550	1475
E. D. Robertson, Robertson 1, 13-30-21	*	1128
Kern County (Poso Creek)—		
Little & Gilstrap, Keating 2, s w nec 20-27-27	*	2458
Fresno County— (East Coalinga Eocene Pool)		
Robert S. Lytle, No. 3-7F, s e nwc ne¼ nw¼ 7-20-16	1798	7268
No. 3-18F, s e w¼c nw¼ 18-20-16.	2633	7272
Ventura County (Sespe Area)—		
Merchants Pet. Co., Cochrane 8, s w nec 1-4-20 (W)	250	1910
Tulare County (Ducor Area)—		
Amalgamated, Konda 6, s e c/ls 23-24-27 (W)	*	2072

• Failures; † Junked; ¶ Million cu. ft. gas.

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Haynes. E. E. Pyles, chairman of the operating committee in charge of development, states that the company will not drill for production deeper than the Ranger zone, around 3000 feet, and the Terminal zone, about 4000 feet. Production will offset Westgate Greenland, Hancock Oil Company, Dunlap, and General Petroleum Corporation leases.

Long Beach Busy

Signal Oil & Gas Company is working on more than half the total number of wells it is to drill on a block of Long Beach Harbor oil property. It has completed three wells there in the Ranger zone, and is drilling three others, while derricks are going up for two more in an 18-well program.

In an effort to widen Cole's Levee field, Union Oil Company has spudded Kernco-2-11 on Section 11-31-25, north of its outpost producer in the eastern extension of the field. Ohio Oil Company is scheduled to drill its No. F-3 just across the section line, but is waiting for release of a crew.

Union's wildcat seeking a possible connection between Rio Bravo and Wasco is due for completion. Situated between Shafter and Wasco, Kernco No. 1-36 is being reamed for casing to be set at 12,780 feet. Another Union completion due is Kernco No. 8-24 at North Rio Bravo, which is drilling at 10,843 feet.

Oklahoma City.—Headquarters of Coline Oil Company will be moved July 1 from Oklahoma City to Amarillo. A field office will be maintained here.

Preparing to move in for test of Mississippi block

Jackson, Miss.—Union Producing Company is preparing to move in rig from its recently abandoned wildcat in Section 12-8n-1w, in Madison County, Mississippi, to a block it assembled several months ago in Humphreys County where it has been curing titles recently. Latest purchase there was 2000 acres in township 14 north, range 4 west.

The same company has been buying leases recently on a 10-year basis around the recently discovered "Tinsley Dome" in township 10 north, range 3 west where Southern Natural Gas Company has also been leasing actively. The "Tinsley Dome" recently discovered by Frederic F. Mellen, supervising geologist for the WPA-Mississippi State Geological Survey, is now being detailed and core drilled. There has been a considerable trading in minerals around the "dome."

Phillips Petroleum Company has informed state authorities at Jackson that permit has been secured from the War Department to conduct a geophysical survey of state-owned lands in the Gulf of Mexico (Mississippi Sound) off the coast of Harrison, Hancock and Jackson counties. This company was recently successful bidder for this option. It is moving a shooting unit to the Mississippi Sound from the Mobile Bay littoral where it has been employed several months.

Southeastern Completions

GEORGIA

Company, Well and Location	Init. Prod. Bbls.	Depth
Pierce County (Wildcat)—		
Donald Clark et al, McCaskill 1, Land Lot 332, 4th Land Dist....	*	3570
MISSISSIPPI		
Madison County (Wildcat)—		
Union Producing Co., Anderson 1, 12-8n-1w	*	6265

* Failures; † Junked; ¶ Million cu. ft. gas.

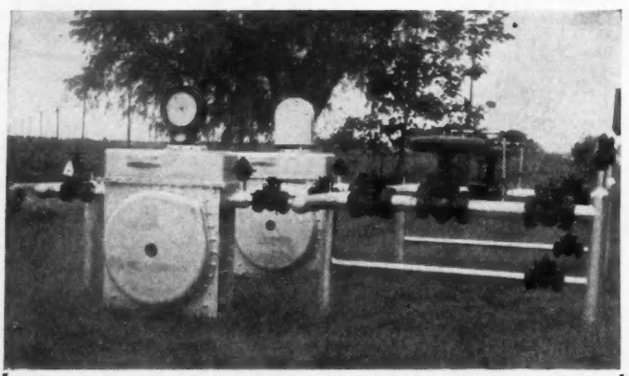
Florida test may go to 10,000 feet

Miami, Fla.—Having set a depth record for the southeastern states, Peninsular Oil & Refining Company's Cory 1, C NW 6-55s-34e, Monroe County, Florida, 41 miles west of Miami, continued drilling ahead last week at 9365 feet in hard lime. Original contract depth was 6500 feet, but it is likely that the test will be taken to 10,000 feet. Loffland Brothers are contractors.

Mission River field asks shut-down exemption

The Texas Railroad Commission was requested to exempt wells in the Mission River field, Refugio County, from provisions for the Saturday and Sunday shut-down at a hearing held in Austin last week. There are four wells in the field producing water in quantities varying from 50 to 98 percent.

W. F. Morgan, operator of the properties, said that several attempts had been made to produce the wells within allowables fixed by the commission, but it appeared the wells would go dead unless they were produced continuously.



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New Mexico Fields

Chaves County well making small oil flow

Hobbs, N. M.—Chaves and Lea counties contributed important developments the past week, with the former registering its first oil producer from the lower lime section after a long period of adverse prospecting.

The 1¾-mile interval between the Cooper and Lynn fields, Lea County, was halved the past week when Continental Oil Company et al's Lynn 1-A-28, C SW NE 28-23s-36e, scored a spectacular flow from the regular lime horizon. The well flowed 450 barrels of 36-gravity oil natural in 1 hour through 7-inch casing with 3-inch drill pipe suspended in the hole from broken pay at 3633-68 feet, with an elevation of 3458 feet. The best porosity was logged at 3654-59 feet. The flow was killed to remove stem and land 2-inch tubing a few inches off bottom. The well later tested 71 barrels hourly through ¾-inch tubing choke, with gas volume rated at 887,000 feet daily on completion gauge. The nearest producer in the Lynn field is the Texas Pacific Coal & Oil Company's State 2-A, discovery oil well for the area, which was completed March, 1930, and continues to flow 45 barrels daily.

Chaves County's oil prospects were brightened when Nay Hightower et al's M. E. Billingslea 1, C SW NE 28-11s-30e, responded to acid treatment after plugging back from salt water at 3439-45 feet to 3430 feet. The well swabbed 35 to 50 barrels of oil daily after using 1000 gallons of acid with 2-inch tubing packer set at 3129 feet. It was due to be re-acidized with 1500 gallons late last week. Two recently announced wildcats are being started in the township adjoining on the north.

New tests authorized for Lea County the past week declined to the lowest level for the year. There were 4 locations, including Addison Oil Company and Gulf Oil Corporation's Knight 4, C SE NW 27-24s-37e; Great Western Producers, Inc.'s State-Gulf 3-B, near C NE NW 32-23s-37e; and Phillips Petroleum Company and Pure Oil Company's Woolworth 8, C NW NE 33-24s-37e, all in the Mattix sandy-lime area. The single contribution by the Vacuum field was Drilling & Exploration Company's State-Shell 2-M, SW NW SE 29-17s-35e. Magnolia Petroleum Company's State 1-S, 3¼ miles northwest of the Vacuum field discovery well, resumed drilling at 4350 feet late last week after landing 7-inch pipe and changing to cable tools.

The Lovington pool was completing its fifth oil producer late last week, and its prolific nitrogen well was placed under control after blowing for a month. Repollo Oil Company's State 2-A-182, SW NE SW 31-16s-37e, succeeded in lubricating off nitrogen flow at 4108 feet while the well was making 11,000,000 feet daily. Rotary returns were lost in attempting to deepen, due to the presence of a cavity or crevice. Cotton seed hulls and other "stuffins" were being pumped into the hole to restore circulation, according to late reports. Magnolia Petroleum Company's State 1-Q, south offset to Skelly Oil Company's discovery oil well, drilled to 5110 feet, with an elevation of 3849 feet. Swabbing tests failed to lower the oil level below 2500 feet from bottom. The well refused to flow natural

New Mexico Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Eddy County—		
Jones et al, Brainard 1, nw sw nw 1-18s-27e	*	481
Lea County (Eunice)—		
Gulf, Mattern 4-E, c sw sw 1-22s-36e	1272	3790
T. P. Coal & Oil Co., State 15-A, c ne nw 11-22s-36e	168	3856
Lea County (Lynn)—		
Continental et al, Lynn 1-A-28, c sw ne 28-23s-36e	1704	3668
Lea County (Langlie)—		
Anderson - Prichard, Woolworth 1, nw ne ne 17-25s-37e	¶8.4	3454
Lea County (Mattix)—		
Schermerhorn Oil Corp., Woolworth 6, c sw se 28-24s-37e	1875	3550
Lea County (Vacuum)—		
Cities Service, State 2-K, c se ne 27-17s-35e	408	4625
Drilling & Explo. Co., Inc., State-Shell 1-M, c sw se 29-17s-35e	149	4665
Phillips, State-Santa Fe 12, c ne nw 28-17s-35e	14	4700
State-Santa Fe 15, c ne ne 28-17s-35e	*	4700
State-Santa Fe 16, c nw sw 5-18s-35e	*	5031
San Juan County (Rattlesnake)—		
Continental & Santa Fe Corp., Rattlesnake-Munoz 88, ne ne 2-29n-19w	46	883

* Failures; † Junked; ¶ Million cu. ft. gas.

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after using 1000 gallons of acid at a maximum pressure of 2400 pounds, and the lime section will be treated again with 5000 gallons of acid.

Magnolia Petroleum Company's Selby 1, 1¼ miles east by south of oil production in the Lovington pool, was drilling lime with cable tools at 4707 feet.

West Michigan lease play spreads into Wisconsin

Milwaukee, Wis.—Recent activity in Western Michigan has resulted in leasing activity in Door County, eastern Wisconsin. Dr. G. M. Shewalter, Green Bay, is arranging a block in North Sturgeon Bay Township, with leases on 2000 acres of a 3000-acre block already signed. Thus far, Wisconsin is without oil or natural gas production.

Kelsey allowable hiked 510 barrels

An increase of 510 barrels in the allowable for the Kelsey field, Brooks County, was provided in an order of the Texas Railroad Commission issued last week. The new allowable of 988 barrels becomes effective on May 10.

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Rocky Mountain Fields

New producing horizon in Dakota sand at Cole Creek. Lease campaign brisk on Montana-Canadian border.

Casper, Wyo.—Development of another commercial producing zone in Cole Creek, Natrona County, central Wyoming, was assured this week when General Petroleum Corporation's Government 1, NW NW SE 21-35n-77w, flowed 100 barrels daily by heads from the Dakota sand through gun perforations in the 6⅝-inch casing string at 7912-30 feet. The well had been drilled to 8511 feet for a test of the Sundance.

Jurassic beds in the well proved unproductive and the company cemented back inside the pipe, set at 7974 feet on top of the Lakota sands, original producing formations for the field.

Following the successful test of the Dakota level, the formation is being packed off, to permit testing the Muddy and Mowry formations above. The well originally was completed in June, 1938, in the Lakota sand at 7974-8013 feet, where it tested around 250 barrels initial.

Leasing activity along the Montana-Canadian border in the North Cut Bank area has increased sharply this week following completion a week ago of the record gasser for the field. Several operators now active in the main sector of the field are acquiring additional acreage along the north "nose." Eight hundred acres have been added to the holdings of Nadeau Brothers, Cut Bank operators, who hold several thousand acres in the northern sector of the field.

Drilling Increases

Drilling activity in Montana also showed a pick-up during the past week. What may be the best well in the Kevin-Sunburst field in recent years drilled in early this week and flowed 60 barrels of oil in 12 hours natural. Only a slight show of oil is generally encountered in the lime producing formation of this field, necessitating acidization before commercial production is obtained. Completion of a flowing well without use of acid is practically unheard of in the field. Operators have announced the test will be produced naturally for a time to determine its productivity before acid is used on the formation. The well, which has a depth of 1741 feet, about 20 feet in the Madison lime horizon, is Big West Oil Company's Dahlquist 9, CNW NE 28-35n-3w, an offset to its Dahlquist 8, one of the major producers of the field.

Oil went over the crown block for a gusher when R. C. Tarrant drilled in McClellan 1, CSW SE 12-34n-6w, in the central section of Cut Bank, Glacier County, Montana. The crew succeeded in controlling the flow shortly after the well drilled in and are cleaning out to complete. No production estimate was released.

Work of expanding the new Glacier Production Company refinery at Cut Bank to 3300 barrels daily capacity is under way. When started, the plant was rated at 1500 barrels daily and was to process crude from the company's wells in the Cut Bank field. Through a recently completed deal, crude will also be refined for the Socony-Vacuum Oil Company and Producers Refining Corporation, a group of operators in Kevin field.

Mountain States Completions

MONTANA

Company, Well and Location	Init. Prod. Bbls.	Depth
Glacier County (Cut Bank Field)—		
Newell & Chandler, Hintrager 1, cne nw 24-37n-5w	¶43	2617
Texas Co., Unit 6, csw nw 9-32n-5w	57	3015
Santa Rita Oil & Gas Co., Ritchie 4, cnw nw 5-33n-5w	135	2782
WYOMING		
Carbon County (Mahoney Dome)—		
Sinclair-Wyoming Oil Co., Mahoney-Unit 2-A, csw ne 34-26n-88w	80	4507
Fremont County (Shoshoni)—		
Hall & Olliger, 4, swc sw sw 27-38n-93w	*	900
Niobrara County (Lance Creek)—		
Ohio Oil Co., Carrie Putnam 12, nwc sw nw 4-35n-65w	353	4107

* Failures; † Junked; ¶ Million cu. ft. gas.

Michigan Fields

Southwest section still most active in state

Mt. Pleasant, Mich. — Thirty-seven completions were registered in Michigan for the week, including 18 oil wells, 1 gas well and 18 dry holes. All but six of the week's completions were in Southwestern Michigan with completion depths of 1200 to 1900 feet.

New starts totaled 29 and out of the 29 only one was for the central part of the basin, the others being in Southwestern Michigan counties and projected for Traverse beds which will range from 1000 to 2200 feet.

The 18 failures for the week represented either outright wildcats or extension tests.

The basin contributed two of the failures. Rowmor Corporation's Spencer 1, Section 21-19n-6w, Redding Township, Clare County, a half mile north of developed Monroe lime production in the Temple pool, failed to log an oil show and will be plugged at 3905 feet. Monroe lime was topped at 3882 feet to place it structurally with the producing field. Failure of this test dampened prospects for any further major extension of the field, only active basin pool in the state.

Only one extension test to the proven area in Temple currently is active. It is Wicklund Development Company's Skelley 1, Section 29-19n-6w, a full mile west of proven production. Test was being standardized at the 6-inch casing point, 1696 feet, for completion to Monroe with cable tools.

Although it added no new area, not previously listed as proven, the Pure

Oil Company's Davis 2, NE 33-19n-6w, Redding Township, made the record potential for the week's completions. It initialed 300 barrels per hour at 3901 feet from Monroe lime.

J. E. Drury's Keefer 1, SE SE Section 5-6n-5w, Ionia County, was the other basin wildcat failure. Test bottomed at 2890 feet after drilling out both Traverse and Dundee horizons dry. No commercial oil production has been drilled in Ionia.

Barry County, which joins Allegan County on the east side and is southeast of Kent County, contributed two Traverse lime failures. James Monroe's Siegeler 1, Section 19-3n-8w, and American Drilling Company's Brown 1, Section 23-2n-10w, are being junked at 2027 and 2022 feet. Barry is one of several Southwestern Michigan counties where major companies have been actively leasing this summer.

Kent County continued to maintain first rank as Michigan's hotspot but the five completions registered added no new proven area. On the contrary, apparent limiting barriers were established on the west and south. R. A. T. Wright's Heald 1, SE SW SE 5-6n-12w, Wyoming Township, a half mile south of proven Traverse production, drilled this zone dry and is being junked at 1950 feet. Robt. W. Atha's Sagman 1, SW NE NE 6-6n-12w, a half mile west of proven production, bottomed at 1931 for a Traverse failure.

From 10 to 15 new locations were reported staked in the Kent play this week. Imperial Refining & Pipe Line Company completed three miles of 4-inch line from the field south to Grandville, crossing the Grand River, to a 22-car rack, and has a pump station under construction. Placing of the line in service is expected to improve the outlet for Kent crude, which up to the present has been moved by truck.

Michigan Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
Allegan County—		
Dewey Battjes, Speet 1, ne ne se 2-4n-16w	*	1722
Chapman Oil Co., Weber 2, ne sw ne 11-4n-13w	612	1598
Socony Vacuum Oil Co., Weber 1, sw nw ne 11-4n-13w	400	1591
Smith 1, sw se se 15-4n-13w	450	1531
Mich. Devonian, Green 2, se sw se 15-4n-13w	580	1561
Spencer Cook, Stegeman 1, sw sw nw 5-1n-13w	*	1699
C. W. Teater, Martindale 1, sw sw nw 29-1n-12w	*	1515
Barry County—		
James Monroe, Siegler 1, nw sw sw 19-3n-8w	*	2027
American Dr. Co., Brown 1, nw nw nw 23-2n-10w	*	2022
Clare County—		
Mammoth Pro. & Ref. Co., Van Horn 2, sw ne se 3-18n-6w	94	3906
Rowmor Corp., Spencer 1, c s se se 21-19n-6w	*	3905
Pure, Davis 2, c w e ne 33-19n-6w	6000	3901
Socony Vacuum, Fell B2, e w ne 33-19n-6w	2500	3895
Ionia County—		
J. E. Drury, Keefer 1, e sw se 5-6n-5w	*	2890
Isabella County—		
Cities Service, Drake 1, se ne ne 20-16n-3w	22	3709
Kalamazoo County—		
Cecil Steele, Budrose 1, nw ne sw 8-4s-11w	*	1225
Kent County—		
Swanson Con. Oil Co., LaQuea 1, se sw se 32-7n-12w	90	1791
Smith Pet. Corp., Livingston 2, sw se se 32-7n-12w	400	1823
Wolverine Nat. Gas Co., Gavin 1, nw ne nw 5-6n-12w	600	1863
R. A. Wright, Heald 1, se sw se 5-6n-12w	*	1950
Montcalm County—		
Taggart Bros., Lint 10, c e w nw 8-12n-9w	¶11	1136
Van Buren County—		
Whitehill, Martindale 1, ne se nw 34-2s-16w	*	1009
Chris. Schrauben, Joy 1, ne nw ne 4-1s-14w	*	1390
Rowe & Kernodles, Decker 3, nw se se 7-1s-14w	275	1214
West 2, nw ne ne 18-1s-14w	1100	1219
F. P. Hurt, Healy 4, nw ne se 7-1s-14w	700	1226
O. O. Borden, Stewart 5, se sw ne 7-1s-14w	400	1223
C. C. Goff, Miller 3, se nw ne 24-1s-14w	300	1352
Miller 5, ne sw ne 24-1s-14w	900	1361
Bridger Basin, Fox 1, nw nw se 11-1s-15w	*	1178
Parisian 1, ne nw nw 1s-15w	*	1300
Forest Ruby, Smith 1, ne se ne 11-1s-15w	200	1180
Red-Man Oil Co., Griffen 1, nw nw nw 29-4s-14w	*	1301
Huges & Rands, Brown 1, se se se 34-3s-15w	*	1190
Meredith & Fox, Phillips 1, se nw nw 19-1s-13w	*	1156
G. M. Obenauer, Vought 4, nw ne se 32-4s14w	*	1002

* Failures; † Junked; ¶ Million cu. ft. gas.

Michigan moving to join interstate oil compact

A concurrent resolution which would empower the governor to appoint a Michigan representative to sit in on Interstate Compact Commission conferences this year, was passed in the House this week, and sent to the Senate.

Sullivan City hearing date set for June 8

The Texas Railroad Commission has reset for June 8 the hearing to fix operating rules on the new Sullivan City field, Hidalgo County. The hearing had been set for May 8, but operators were not prepared to present data on the field.

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WILDCAT REPORT
New Starts and Completions

STATE	WILDCATS STARTED		WILDCAT TESTS COMPLETED							
			Total		Oil		Gas		Dry	
	This Week	This Year	This Week	This Year	This Week	This Year	This Week	This Year	This Week	This Year
Alabama	...	3	...	1	...	...	...	...	...	1
Arkansas	1	12	1	7	...	...	...	...	1	7
California	2	103	3	53	1	16	...	1	2	36
Colorado	...	...	...	3	...	...	...	...	...	3
Georgia	...	2	1	1	...	...	...	...	1	1
Illinois	25	197	19	137	4	13	...	...	15	124
Indiana	...	10	1	10	...	3	...	1	1	6
Kansas	12	80	5	75	2	27	...	1	3	47
Kentucky	...	5	...	10	...	5	...	...	...	5
Louisiana	4	55	3	34	1	7	...	...	2	27
North Louisiana	...	19	1	11	...	3	...	...	1	8
South Louisiana	4	36	2	23	1	4	...	...	1	19
Michigan	6	78	10	113	...	7	...	...	10	106
Mississippi	...	3	1	1	...	...	...	...	1	1
Missouri	...	1	...	...	...	...	...	...	...	...
Montana	...	1	...	...	...	...	...	...	...	...
New Mexico	...	18	...	5	...	...	...	1	...	4
New York	...	...	...	2	...	...	...	1	...	1
Oklahoma	5	75	2	68	...	8	1	4	1	56
Ohio	...	2	1	7	...	1	...	...	1	6
Pennsylvania	...	1	...	2	...	...	...	...	...	2
South Dakota	...	1	...	...	...	...	...	...	...	...
Texas	30	396	27	414	2	40	2	5	23	369
East Texas	2	48	3	37	1	2	...	...	2	35
North Texas	5	57	5	93	...	18	...	1	5	74
Gulf Coast	8	48	4	32	1	3	...	...	3	29
Panhandle	1	3	...	4	...	...	...	...	...	4
South Texas	10	156	9	179	...	11	2	3	7	165
West Texas	4	84	6	69	...	6	...	1	6	62
West Virginia	...	1	...	...	...	...	...	...	...	...
Wyoming	1	...	1	...	...	...	...	...	1	...
Total U. S.	86	1051	75	944	10	130	3	15	62	799

ARKANSAS

FIRST REPORTS

Crawford County—Arkansas Oil & Mining Co.'s St. Louis Trust Co. et al 1, c ne sw ne 10-11n-31w, moving in materials.

COMPLETIONS

Clark County—Joe B. Zick, Tr.'s A. P. Greene 1, ne se se 21-8s-18w, top Nacatoch 510 ft, top Paleozoics 1238 ft, abnd 1248 ft in Paleozoics.

CALIFORNIA

FIRST REPORTS

Kern County — Lindley C. Morton's KCL 14-1, 330 ft n, 330 ft w e¼c 14-26-28, Mount Poso area, elev 1240 ft, grade.

Tulare County—Crusaders Pet. Corp.'s Quinn 1, 100 ft n 500 ft w sec 9-25-27, Richgrove area, ru cable tools.

COMPLETIONS

Orange County—Union's Nieto 1, 330 ft s 330 ft w nec 12-5-12, Seal Beach area, abnd 7101 ft.

Ventura County—Merchants Pet. Co.'s Cochrane 8, 1222 ft s 713 ft w nec 1-4-20, Sespe area, I.P. 250 B/D until pumped off to 45 B/D, 22.0 grav 1.0 percent, top oil sand 1758 ft, td 1910 ft.

Tulare County—Amalgamated's Konda 6, 50 ft s 115 ft e c/ls 23-24-27, Ducor area, abnd 2072 ft.

GEORGIA

COMPLETIONS

Pierce County—Donald Clark-Adams' McCaskill 1, located 660 ft s of n line and 150 ft e of c line land lot 332, Fourth Land district, elev 70 ft, abnd 3570 ft.

ILLINOIS

FIRST REPORTS

Alexander County—Barr, Shirk & George's Hughes 1, se nw nw 35-15s-2w, Unity tnp, sp.

Christian County—Treleaven's Micenheimer 1, c sw sw nw 31-12n-2w, Johnson tnp, dk. G. W. Helms' Howell 1B, se se ne 25-15n-2w, Mt. Auburn tnp, shut down 100 ft.

Clark County—Breeding et al's C. Gard 1, nw se se 2-9n-12w, Melrose tnp, dr. Strickler et al's O. E. Tarman 1, nw nw nw 13-9n-13w, Orange tnp, dk. Leatherman's Tyhurst 1, nw sw se 26-9n-14w, Johnson tnp, dr. Strickler et al's O. E. Tarman 1-B, se sw sw 26-10n-13w, Martinsville tnp, dk.

Clinton County—James H. Morcom's Rohr 1, nw ne 9-2n-3w, Wade tnp, moving in materials for a Niagaran lime test. Santa Fe Oil & Gas Co.'s Robbin 8, nw sw se 5-1n-3w, Santa Fe tnp, rig.

Cumberland County—Culpepper's Gardner 1, ne se ne 2-10n-10e, Union tnp, dr.

Jasper County—Shell Oil Co. and Frank Brown's Tracey O. Crouse 1, c sw se 30-6n-9e, Smallwood tnp, set surface pipe.

Jefferson County—M. B. Armer and J. J. Ruck's Paul Gilbert 1, nw ne sw 25-2s-2e, Shiloah tnp, dr. V. O. Lewis' Bates 1, ne nw ne 18-1s-1e, Grand Prairie tnp, abnd in lower Chester series, 1839 ft. Pyramid Petroleum Co.'s Inland Steel Co. 1, c s nw sw 30-4s-2e, Elk Prairie tnp, dr.

Lawrence County—Joe Kesl et al's G. Gillespie 2, c ne sw 13-4n-11w, Russell tnp, dr.

Marion County—W. B. Dallas & D. Shendel's Toulme 1, se se se 25-2n-1e, Odin tnp, dr.

Perry County—Harry Harter's Flanaus 1, c se sw nw 10-4s-2w, Beaucoup tnp, dr. Stephens & Ward's Albers 1, sw se se 34-4s-2w, Beaucoup tnp, dr.

Richland County—Andrews et al's Wattleworth 1, sw sw se 26-4n-10e, Olney tnp, rig.

St. Clair County—Longrieve et al's J. Schaller 1, nw ne nw 10-3s-7w, Lenzburg tnp, dr.

Shelby County—Illican Oil Corp.'s Can 1, sw se ne 12-13n-2e, Flat Branch tnp, rig.

Washington County — James McIlwain's Pieper 1, se sw se Venedy tnp, loc. Wilson et al's Bertha Greenburg 1, nw sw sw 28-3s-3w, Pilot Knob tnp, dr.

Wayne County—Whitty et al's Duke 1, c n ne ne 28-2s-6e, Orel tnp, dr. Hunt's Harper 1, c ne se sw 3-3s-6e, Orel tnp, rig.

White County—Superior Oil Co.'s Fitton 1, sw sw ne 26-4s-14w, Phillips tnp, rig.

COMPLETIONS

Christian County—G. W. Helms' Howell 1, se se ne 25-15n-2w, Mt. Auburn tnp, abnd 450 ft, to drill 1B on same loc.

Clinton County—Santa Fe Oil & Gas Co.'s Maddox 4, w sw sw 4-1n-3w, Santa Fe tnp, top Bethel 1126 ft, abnd 1203 ft. K. J. Farrelly's George Bergman 1B, nw sw nw 25-1n-4w, Germantown tnp, abnd loc.

Coles County—W. R. Miller's Giffin 1, se ne ne 22-11n-10e, Hutton tnp, pumped 10 bbls oil and 5 bbls water from Pennsylvanian sandstone after 30 quart shot, td 538 ft.

Franklin County—Gulf Refining Co.'s U. S. Steel 1, c e ne ne 20-6s-4e, Eastern tnp, top St. Louis 3310 ft, abnd 3435 ft.

Hancock County—Minnie & Grady's J. Roberts 1, se ne sw 24-4n-5w, St. Marys tnp, pumped 3 bbls oil and 100 bbls water from Hoing sand after 20 qt shot, td 382 ft.

Jefferson County—V. O. Lewis' Bates 1, ne nw ne 18-1s-1e, Grand Prairie tnp, abnd in lower Chester series at 1839 ft. Midfield Oil Co.'s R. T. Ervine 1, sw sw se 24-2s-1e, Casner tnp, top Ste. Genevieve 2180 ft, abnd 2310 ft. Beavers et al's Eichman 2, nw ne ne 28-2s-1e, Casner tnp, top Ste. Genevieve 2176 ft, abnd 2285 ft.

Marion County—Hawley Oil & Gas Co.'s Copple 1, sw sw ne 28-1n-1e, Centralia tnp, top Ste. Genevieve 2116 ft, abnd 2283 ft. Johnson & Betts' Johnson 1, ne nw ne Centralia tnp, top Bethel 1875 ft, abnd 1923 ft. Texas Co.'s W. C. Wright 1, ne se ne 36-2n-1e, Odin tnp, top St. Louis 2160 ft, abnd 2210 ft. Max Pray's J. Langenfeld 1, sw sw nw 4-2n-1e, Sandoval tnp, abnd in Devonian at 3098 ft. Graves et al's Marion County Coal Co. 1, sw sw sw 29-2n-1e, Sandoval tnp, abnd loc. Heenan & Coe's Millican 1, ne nw nw 16-3n-4e, Omega tnp, top St. Louis 2542 ft, abnd 2556 ft.

Monroe County—Ames Drilling Co.'s Gummershiemer 1, nw 2-2s-10w, Waterloo tnp, top Trenton 410 ft, pumped 29 bbls 24 hrs, td 434 ft.

Montgomery County—Independent Producers & Refiners' Herman Niemann 1, nw se sw 29-8n-5w, South Litchfield tnp, abnd 100 ft. Fred De Mier's Charles Kanady 1, sw se sw 31-9n-4w, Butler Grove tnp, abnd in lower Mississippian at 871 ft.

Wabash County—Crum & Bartlett's Camilla J. Stansfield 1, sw se se 9-2s-13w, Keensburg tnp, top Diehl and Jordan sand 1705 ft, pumped 43 bbls on 28 hr test.

INDIANA

COMPLETIONS

Monroe County — W. B. Pardoe's Union Trust Co. 1, se se nw 29-8n-1e, Salt Creek tnp, abnd 2502 ft.

KANSAS

FIRST REPORTS

Barton County—Armer et al's Hoffman 1, nwc sw 18-16-11w, rig.

Butler County—Elbar Corp.'s Martin 1, ne se se 24-26-7e, dr. Carey et al's Kelley 1, se nw sw 20-27-4e, fsg 550 ft.

Cowley County—Hartman et al's Brown 1A, sec nw 33-30-4e, dr.

Gray County — Champlin Refining Co.'s Koehn 1, c ne sw 34-28-29w, lcn.

Rice County—Continental Oil Co.'s Hamilton "B" 1, swc ne 19-18-7w, pits. Fred Jones' Habiger 1, nec sw 9-18-10w, pits. Finston et al's Hathaway 1, cnl nw sw 27-19-10w, rig. Phillips Petroleum Co.'s Brandenstein 1, c se nw 35-19-10w, dr 3000 ft. Gulf Oil Corp.'s Linke 1, c el ne se 36-19-10w, dr 3200 ft.

Rooks County—Web-Son et al's Bair 1, se ne nw 34-10-19w, lcn.

Russell County—Branden et al's Blehm 1, swc nw 11-14-14w, pits.

COMPLETIONS

Barton County—Sinclair-Prairie Oil Company's Schmitt 1, nec nw 20-16-11w, new horizon in old pool, top Lansing 2975 ft, top Conglomerate 3277 ft, top pay 3306 ft, td 3310 ft, 213 bbls, 39.1 gr. Long et al's Eveleigh 1, swc ne 3-18-14w, one half mi nw Boyd, top pay 3365 ft, td 3371 ft, acidized 3500 gals, squeeze job, no effective water shut off, 8 bbls in 4 hrs, abnd.

Cowley County—Lloyd et al's Chamness 1, nec sw 35-30-3e, top Stalnaker 2055 ft, top Kansas City 2438 ft, top Mississippi 3053 ft, top Arbuckle lime 3445 ft, abnd 3457 ft.

Johnson County—Ok Supply Co.'s Knabe 1, c ne ne 15-14-22e, 2 mi ne Gardner, top Bartlesville 830 ft, td 856 ft, shot 40 quarts, perf csg 707-720 ft, pumped 42 bbls in 7½ hrs, pumped off, 30 bbls from 2 sands.

Stafford County—Lauck et al's Connaughley 1, swc 18-24-13w, 4 mi west St. John pool, top Topeka 3160 ft, top Lansing 3590 ft, top Viola 4019 ft, top Arbuckle lime 4211 ft, td 4233 ft, acidized 1000 gals, perf csg 3626-2826 ft, abnd.

NORTH LOUISIANA

COMPLETIONS

La Salle Parish—Adams O&G Co.'s Goodpine Oil Co. 1, c e½ ne sw 1-6n-2e, elev 93 ft, top Wilcox 2605 ft, abnd 2700 ft in hard shale.

SOUTH LOUISIANA

FIRST REPORTS

Calcasieu Parish — Union Sulphur's Drew Manuel Training School 1, South Edgerly area, 990 ft s and 330 ft e of center of sec 17-10s-11w, lcn.

Iberville Parish—Housh & Thompson's L. N. Folse 1, Samstown prospect, 440 ft n and 530 ft w of SEc of sec 40-11s-13e, dr 2365 ft.

St. Bernard Parish—Carter-Brian & Molero's Delacroix Corp. 1, Lery area, 3200 ft ne along n line of sec 129 fr wc, and 450 ft se at right angles in sec 129-14s-14e, lcn.

Vernon Parish—W. T. Burton's Fee 1, Ful-

lerton area, 1300 ft s of n line and 435 ft w of e line of sec 32-1n-6w, lcn.

COMPLETIONS

Calcasieu Parish — David B. MacDaniel's School Land 2, Chloe area, 210 ft s and 200 ft e of NWc NE¼ sec 16-9s-7w, abnd 7871 ft.

Cameron Parish—Superior's State 1, Grand Lake area, 5650 ft w and 8500 ft n of NEc sec 24-31s-4w, in Lake, comp 384 bbls 33 gravity oil daily, 10/64-in choke, perf. 8365-92 ft.

MICHIGAN

FIRST REPORTS

Kent County—Sun Oil Co.'s Fryling 1, ne ne ne 26-6n-11w, dr. M. L. Jorgensen's Battjes 1, sw sw ne 34-8n-11w, dr.

Midland County—C. W. Teater's Dougherty 1, nw nw 15-13n-1e, dr.

Muskegon County—R. C. Lentz's Ehike 1, ne ne nw 18-12n-17w, rig.

Ottawa County—Fortney Oil Co.'s Walters 1, se nw ne 30-5n-13w, dr.

Van Buren County—Alfred Violette's Stickney 1, ne ne se 26-3s-16w, rig.

COMPLETIONS

Allegan County—Dewey Battje's Speet 1, ne ne ne 2-4n-16w, Traverse 1448 ft, water 1449 ft, abnd 1722 ft. Spencer Cook's Stegeman 1, sw sw nw 5-1n-13w, abnd in Traverse 1699 ft. C. W. Teater's Martindale 1, sw nw 29-1n-12w, abnd 1515 ft.

Barry County—James Monroe's Siegler 1, nw sw sw 19-3n-8w, abnd Traverse, 2027 ft. American Drilling Co.'s Brown 1, nw nw nw 23-2n-10w, abnd in Traverse 2022 ft.

Clare County—Rowmor Corp.'s Spencer 1, c s½ se se 21-19n-6w, Monroe 3882 ft, water 3896 ft, abnd 3905 ft.

Ionia County—J. E. Drury's Keefer 1, e sw se 5-6n-5w, abnd 2890 ft.

Kalamazoo County—Cecil Steele's Budrose 1, nw ne sw 8-4s-11w, Traverse 1204 ft, abnd 1225 ft.

Van Buren County—M. F. Whitehill's Martindale 1, ne se nw 34-2s-16w, Traverse 980 ft, abnd 1009 ft. Red-Man's Griffen 1, nw nw nw 29-4s-14w, abnd 1301 ft.

MISSISSIPPI

COMPLETIONS

Madison County—Union Producing Co.'s Anderson 1, located 3960 ft w of NEc 12-8n-1w, elev 280 ft, tested 14 thribbles sw in 7 minutes through ⅜ inch choke top and bottom in test at 6228 ft, set 7 inch OD csg 4479 ft, stopped plug at 4446 ft, perforated and tested where previously there had been show oil 4414-24 ft, abnd 6265 ft.

OHIO

COMPLETIONS

Medina County—Burtner, Morgan & Sleven's M. E. Swineheart 1, Wadsworth tnp, top Clinton 3794 ft, very small oil showing, abnd 3945 ft.

OKLAHOMA

FIRST REPORTS

Cleveland County—Hall et al's Mantooth 1, nwc 24-6n-1e, dr.

Cotton County—Costley's Garrison 1, ne sw nw 18-4s-10w, dr.

Harmon County—Russo Drilling Co.'s Abernethey 1, c sw sw 12-2n-26w, rur.

Lincoln County—Granelor's Locqushment 1, nec 28-14n-6e, rig.

Pottawatomie County—H & H Oil Corp.'s Boland 1, se ne nw 28-11n-3e, rig.

COMPLETIONS

Grady County—Carter Oil Company et al's Smith 1, c se sw 26-5n-8w, in old Chickasha gas pool, completed, perforated from 6070-6430 and 5495-5517 ft, 5530-5350 ft, 13,180,000 cubic feet gas, bhp 1880 lb.

Hughes County—Shelton et al's Gilmore 1, c n½ ne se 7-5n-9e, 3 mi ne Allen pool, abnd 970 ft.

EAST TEXAS

FIRST REPORTS

Rusk County—Hamm & Boggess et al's W. G. & W. M. Ross 1, 2803 ft se along se line fr swc of 143-ac tract and 252 ft due n, or 3340 ft fr sw and 150 ft fr se lines of J. McCune sur, 3 mi nw Mount Enterprise, rig.

Trinity County—McAlpine et al's C. V. Dilley 1, 600 ft fr s and 1200 ft fr e lines of J. Grissett sur, 7 mi n of Trinity, mim.

COMPLETIONS

Angelina County—K. L. McHenry et al's Mrs. J. S. Russell 1, 450 ft fr w and 175 ft fr n lines of 20-ac tract, or 3155 ft fr s and 11,385 ft fr w of A. Flores sur, 4 mi n Lufkin, Cane River sand pay 1008-21 ft, td 1032 ft, pumped 3 bbls oil and 50 bbls fresh water initial.

Henderson County—Dulop Oil Co.'s S. B. Cornelius 1, 330 ft out of sec of w 100 acres of 200-ac tract, Eliza Washburn sur, 3½ mi nw Stockard, elev 430 ft, Pecan chalk 2134-2460 ft, top Austin chalk (soft) 3252 ft, hard chalk 3320-3675 ft, top Woodbine series 4252 ft, abnd 4300 ft.

Trinity County—W. C. Shirley et al's Southern Pine Lumber Co. 1, 150 ft fr e and 600 ft fr s lines of J. A. Sepulveda sur, 5 mi nw Apple Springs, abnd 1208 ft.

NORTH TEXAS

FIRST REPORTS

Clay County—Frabor-Hodges Corp. & Mid-Union Drl. Co.'s R. C. Kinder 1, 330 ft out of nec lot 11, blk 2, Clark-Plumb sur, mim for 5000-ft test.

Cooke County—Pois & Schultz's T. H. Sears 1-A, 150 ft fr n and 200 ft fr w lines of 915.8-acre tract, M. Langham sur A-564, 3 mi s Myra, mim for 1200-ft test.

Montague County—Sinclair Prairie Oil Co.'s G. Whaley 1, 990 ft out of swc of 439-ac tract, sec 16, BBB&C sur, lcn.

Wichita County—H. R. Phillips et al's Mack Thomas 1, 450 ft fr n and 150 ft fr e lines of AB&M sur A-422, 5 mi nw Iowa Park, lcn for 850-ft test.

Young County—K. R. March et al's S. A. Stowe 1, 1050 ft fr e and 150 ft fr s lines of tract, sec 228, TE&L Co. sur, 1½ mi se Olney, lcn for 1100-ft test.

COMPLETIONS

Archer County—Piper & Wilson's C. Cowan 1, 1600 ft fr n and 1320 ft fr w lines sec 45, Jefferson C.S.L. sur, abnd in w.s. 1087-95 ft. Riner-Fain & Stilley's R. C. Kinder 1-B, 1300 ft fr e and 1800 ft fr s lines blk 57, blk 5, Clark-Plumb sur, Gunsite lime 1316-18 ft, abnd 1360 ft.

Cooke County—Seitz Bros. Ltd., et al's W. A. Harris 1, 330 ft fr s and 2465 ft fr w lines of J. Ellerd sur, A-1482, top Hooser lime 1237 ft, trace oil saturation 2695-2700 ft, abnd in shale and shells 3341 ft.

Grayson County—Jim McMurray et al's Dr. T. J. Long 1, 300 ft s and 330 ft w of M/N/NEc of 178½-ac tr, Jas. Garland sur, abnd 3929 ft.

Wichita County—Westbrook Oil Corp.'s L. F. Ramming 1, 2042 ft fr s and 1704 ft fr w lines of tract, Henry Hastie sur A-92, tested water and abnd in sand 1226-45 ft.

TEXAS PANHANDLE

FIRST REPORTS

Roberts County—E. J. Dunigan, Jr., Tr., P. C. Ledrick 1, 1320 ft n and 1320 ft w of nwc sec 5, blk A-5, E. L. Ry. sur, but in G. & M. sec 34, blk C, mim.

TEXAS GULF COAST

FIRST REPORTS

Brazoria County—Wynn Crosby's A. Paine 1, 7000 ft ne of Wilson 1, A. G. Reynolds sur, lcn.

Ft. Bend County—Superior's S. A. Beard 1, Long Point area, 330 ft ne of sw line and 2465 ft se of nw line of E&TC sec 111, lcn. Woodland Oil Co.'s Bery 1, Needville area, 330 ft from the se line and 330 ft from the ne line of nw 80 acres of 160-acre tract, H&TC No. 25, lcn.

Harris County — J. Deering's Ridgeview Farms 1, Cypress area, 3810 ft from s line of Durkmorth sur, and 1639 ft w of e line of Moody sur, lcn. Jack Frazier's L. E. Griffith 1, Mt. Houston area, 330 ft from n and 1650 ft from e line of 677-acre tract, W. Britton sur, lcn.

Jefferson County—Hebert & Smith's Fontenat 1, North Cheek area, 466 ft each way out of the most westerly SWc of tract in H&TB No. 187, lcn.

Orange County — N. W. Hunter's Miller-Vidor Lbr. Co. 1, Vidor area, 1400 ft n and 466 ft e of SWc of J. M. Swisher sur, lcn.

Wharton County—Cockburn et al's Hamburger 1, n of Pickett Ridge, 466 ft from sw line and 466 ft from nw line of WCRR No. 65, lcn.

COMPLETIONS

Harris County — Texas Gulf Prod. Co.'s Weary 1, Aldine area, 451 ft from w and 3527 ft from n line of E. Farrias sur, lot 52, dr to 7665 ft, pb and set 5½-in 6860 ft, perf 6824-34 ft, 5 bbls per hour, ¼-in choke, comp. Midwest Royalty Co.'s Westmoreland 1, Bellaire prospect, center of lot 14, blk 39, of Westmoreland Farms, 3rd addition, J. Wells sur, abnd 9754 ft. Housh & Thompson's Hine 1, San Jacinto Battle Ground prospect, 466 ft from ne and 466 ft from nw line of 45-acre tract, A. McCormick sur, abnd 6523 ft.

Tyler County—J. C. Bonham's Southwest Lbr. Co. 1, Rockland area, 2750 ft e of w line and 150 ft n of s line of F. B. McReynolds sur, abnd 4353 ft.

SOUTH TEXAS

FIRST REPORTS

Bexar County — Swearingen and White's Gembler 1, 1011 ft e line, 1164 ft s line of 395-ac tr, N. Montaya sur 21, spudded.

Bastrop County—V. A. Hughes and Co.'s Lentz 1, 1521 ft most n'ly n line, 1125 ft most e'ly e line, 158-ac tr, Freeman Wilkinson sur 21, acidized and testing 2460 ft, may open new pool.

Cameron County—Sal Vieja Corp.'s Esperson 1, begin at ne cor of sh 3, San Martin gr, go 6400 ft se along nel of sh 3, thence 2550 ft sw at rt ang to lcn, lcn.

Duval County—George Proctor's Fredrick 1, 330 ft n line, 330 ft e line of sw¼ of 344, J. H. Gibson sur, lcn. W. Earl Rowe & R. F. Scheig's Well Estate 1, 2310 ft se line, 2310 ft sw line of BS&F sur 567, prep to move in.

Nueces County—William M. Nicholl's Richardson 1, 330 ft nw line, 440 ft sw line of sec 10, Bohemian Colony subd, Enrique Villareal gr, spudded. Texas Conservative Oil Co.'s Bock 1, 330 ft e of state hiway 16, 330 ft s of n line of s½ of se¼, section 55, George H. Paul's subd, Driscoll Ranch in Joaquin Lopez de Herra gr, spudded.

Starr County—A. E. Henninger's Guerra 1, 353 ft ne line, 217 ft se line por 56, Jurisdiction of Mier, drilling 640 ft, lcn subject to correction.

Webb County—H. H. Henderson and W. W. Harvey's Perez 1, 330 ft s line 1320 ft e line of 100.67-ac lse, J. Poitevent sur 459, spud, set sur csg, woc. P. G. Rouse's Withers 1, 250 ft s line, 250 ft e line of 320-ac lse, AB and M sur 52, lcn.

COMPLETIONS

Bexar County—Joe A. Noake's Oppenheimer, 150 ft w line, 2266 ft s line, 227-ac tr, William Miller sur, 678 ft derrick floor, alternate sand 263-1005, 100,000 cu ft gas per day, 1008½ ft.

Bastrop County—J. F. Jourdan's Lawhon 1, 330 ft most n'ly n line, 330 ft most e'ly wl, 293.5-ac tr and Elizabeth Standifer sur, abnd 2070 ft.

Caldwell County—McNeill Petroleum Co.'s Huff 1, 150 ft n of RR, 1400 ft nw line of 150-ac tr, Solomon Seal league; top Taylor, 1915 ft; top Austin chalk, 2260 ft; top Edwards, 2677 ft, abnd 2688 ft.

Duval County—Frank J. Gravis' Parr 1 (2), 330 ft n line, 330 ft w line, blk 2, Gravis subd, Andres Garcia Heirs "San Andres" gr, sand/oil odor, 5952-67 ft, abnd 6143 ft. Skipper Keller's Gruy Estate 1, 330 ft n line, 330 ft w line of sw¼ of section 391, J. Poitevent sur, Cole sand, salt water, 1815-36 ft, top Government Wells, 2560 ft; top Mirando, 2770 ft, abnd 2786 ft.

Jim Wells County—R. A. Irwin et al's Garcia 1, 466 ft n line, scales 1025 ft w line of section 102, R. J. Kleberg survey, Ab-273, abnd 5468 ft.

Webb County — Superior Oil Company of California's Walker 1, center of lot 4, Ed Claggett subd, section 259, CCSD and RGNG sur, brkn sand, 1710-30 ft, abnd 2334 ft.

Willacy County—C. Andrade III's Yturria Land and Cattle 1, 330 ft e line, 990 ft s line of s'ly se cor of sh 64, Carricitos gr, abnd 7714 ft.

Zapata County — Joe Martinez's Bruni 1, 5570 ft nw line, 1715 ft ne line of Barrocito pasture, Borrego gr, sand 357-63 ft, est 2 mcf, pb td 375, orig td 460 ft.

WEST TEXAS

FIRST REPORTS

Jones County—E. A. Keeler et al's J. M. Radford 1, 986 ft fr n and 1311 ft fr e lines T&P sec 20, blk 16, mim.

Pecos County—H. L. Cain et al's M. Lehn-The Texas Co. 1, 330 ft fr ne and se lines of n¼ H&GN sec 71, blk 10, mim.

Stonewall County—Forest Dev. Corp.-Carl B. King Drl. Co.'s Moreland 1, c sw se H&TC sec 183, blk D, mim.

Yoakum County — Emperor Oil Co.-Chas. Million et al's J. D. Webb 1, c ne sw sec 545, blk D, J. H. Gibson sur, rur.

COMPLETIONS

Ector County—Landreth Production Corp.'s Frank Cowden 1-A, near c sw nw T&P sec 10, blk 44, T-1-N, elev 3184 ft, top anhydrite 1710 ft, trace saturation 4250-55 ft, sul water 4310-4617 ft and abnd. Magnolia Pet. Co.'s T. P. Land Trust 1, sw sw sw T&P sec 9, blk 45, T-1-N, elev 3310 ft, top anhydrite 1540 ft, top Yates 2790 ft, top solid lime 3825 ft, top gray lime 3880 ft, 1st saturation 4295 ft, sul water 4525-65 ft, pb to 4480 ft, shot 510 qts 4288-4473 ft, tested dry, cas parted 3220 ft, abnd.

Fisher County—Frank W. Bennett-F. K. Campbell et al's Martin-Shell 1, 2310 ft fr s and 660 ft fr w lines H&TC sec 113, blk 1, elev 1870 ft, jkd 2204 ft, skid 150 ft west.

Jones County—S. C. Herring et al's Guitar 1, 3755 ft west and 300 ft s of sec T&P sec 42, blk 16, but in Fred Sieberman sur No. 12, abnd 2245 ft. Travers Pet. Corp. (was Jones-Stasney et al's) R. G. Swanson 1, 440 ft out of swc nw¼ sec 184, BBB&C sur, hole full sul water and abnd 3428-30 ft.

Stonewall County—Forest Dev. Corp. et al's T. A. Ellison 1, 330 ft fr n and 600 ft fr e lines nw¼ H&TC sec 114, blk D, abnd 3596 ft.

WYOMING

FIRST REPORTS

Fremont County—Hall & Olliger's 5, nw ne 33-38n-93w, 2 miles east of Shoshoni, spd 254 ft.

COMPLETIONS

Fremont County—Hall & Olliger's 4, swc sw sw 27-38n-93, abnd 900 ft, checked 44 ft lower structurally and abnd as off structure.

NOTES FOR THE Equipment Buyer and User

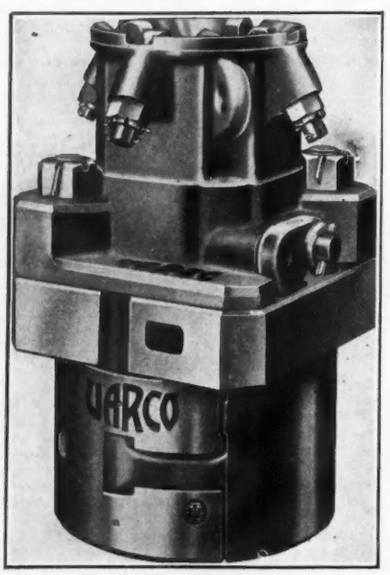
Pin Drive Kelly and Master Bushings

ABEGG & REINHOLD COMPANY

Abegg & Reinhold Company, Ltd., 2533 East 26th Street, Los Angeles, California, announces two new units to its line of rotary drilling equipment. These two units are new in design and principle with a new type of drive being transferred from the kelly bushing to the master bushing by means of pins which replaces the method of the driving square.

Advantages claimed are the driving radius has been doubled; the unit pressure thereby lowered. Furthermore, the pressure is applied at right angles, not in the corners of the square, thus eliminating rounded corners and severe wear. The master bushing bowl extends to the top, leaving more room for the sliding in of pipe slips. This is important where the drill pipe is located to one side. Time in going in and out is materially lowered. Both master and kelly bushings are locked tightly together, preventing the kelly from being pulled or vibrated out of the table. The latch on the master bushing is opened and closed with ease.

The latch utilized upon this new unit is also incorporated in the company's regular line of master bushings for all types of kelly bushings. All kelly bushings are made for either square, octagon or hexagon drive shafts. The careful selection of proper alloy steels, heat treatment and correct engineering principles for long life under severe conditions are brought to a new high by the organization with these new units, the company claims.



Abegg & Reinhold Kelly and Master Bushing.

Safety Cat Head

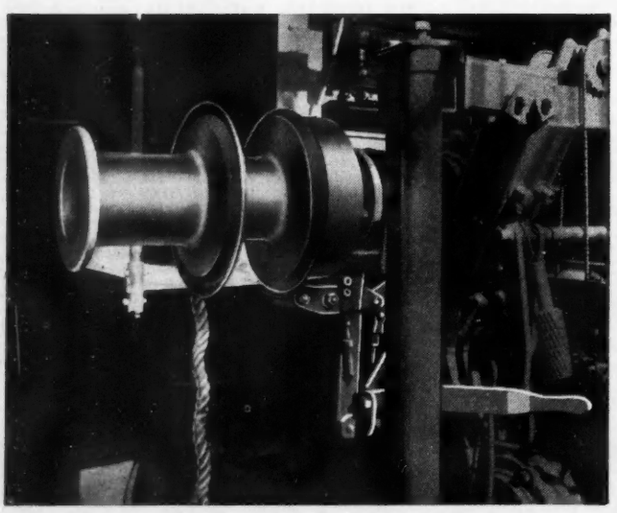
SHAFFER SPECIALTY COMPANY

The Shaffer Specialty Company, Tulsa, Oklahoma, is introducing a new Safety Spinning Line Cat Head which it claims actually prevents accidents because of positive and instantaneous dis-engagement when the operator lets go of the control lever.

The Safety Cat Head eliminates a separate line on the tongs, and fits any drawworks. The spinning line and tong line are incorporated in a single rope by using a "forked" end. One branch of the fork is used for spinning the pipe; the other fork is permanently attached to the tong handle; thus with this type of line the spinning and tonging of pipe is accomplished with a single line.

When used with tubing hoists it not only provides safe operation but increases efficiency by minimizing the use of tongs.

A flanged hub is provided for mounting on the drawworks line shaft and the entire cat head assembly is installed by bolting the companion flange of the cat head and drawworks together. Lever brackets are installed on drawworks jack post. Spinning drum is mounted on a roller bearing and is free rolling. All parts are precision made of high grade metals and friction discs operate in conjunction with nickel-iron driving plates for maximum friction engagement. The company announces it also makes a conventional type cat head in combination with the safety spinning drum for pick-up work.

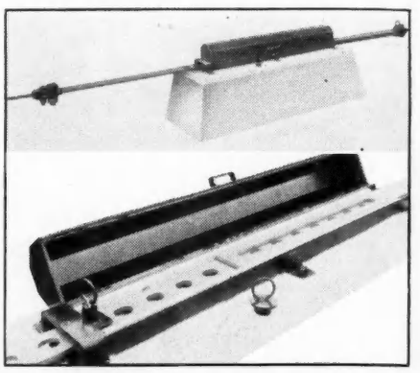


Shaffer Specialty Company Safety Cathead

Rod Line Knock-Off

ALLIED STEEL PRODUCTS CORPORATION

Simplicity of design and safety of operation are the chief features of a new rodline knock-off that is made by Allied Steel Products Corporation, 1407 N. Peoria, Tulsa, Oklahoma. The design is such to hold friction to a minimum. Hook-up is made by the use of steel plugs for insertion through two sliding members that are encased by a safety steel hood. No turnbuckles are necessary. Two sizes are available: Type 9-80 for loads under 9000 pounds, and Type 16-80 for loads under 16,000 pounds.



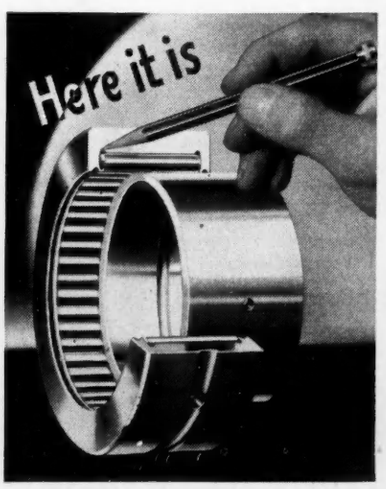
Allied Rod Line Knock-off

Roller Bearing

McGILL MANUFACTURING COMPANY

McGill Manufacturing Company, Valparaiso, Indiana, has announced a new design of full type needle roller bearing known as "Solidend" Multirol that it says insures an increase in load carrying capacity of as much as 12 percent over any previous design.

"Solidend" is intended to be descriptive of the new outer race construction by which rollers are held integral with-



McGill "Solidend" Bearing

NOTES FOR THE Equipment Buyer and User

out the use of end washers and retaining end rings. Roller retaining shoulders are built integral with the outer race so that the possibility of accidentally bending or breaking the conventional endwashers resulting in disassembling the unit is eliminated.

Extra load carrying capacity is accomplished, it is said, by using full length rounded end rollers instead of the usual trunnion or conical ends thereby increasing effective race and roller contact.

A variety of size combinations that can be used with or without the separable inner races in shaft sizes up to five inches facilitates the application of these new bearings. Special and larger sizes are worked out with the help of the engineering department.

Rotary Machine

THE NATIONAL SUPPLY COMPANY

The latest addition to The National Supply Company's line of rotary machines is the Ideal FE-17½ Rotary. Designed for 5000-foot drilling, this new machine is a fully-enclosed oil bath unit incorporating many proven National features of design.

It has a heavy duty ball type main bearing composed of 27 2½-inch diameter balls which operate in oil at all times. The gears are cut on precision machines from alloy steel and have a ratio of 3.33 to 1. Straight or spiral bevel gears are available as specified. The table has a full 17½-inch opening to accommodate both bits and casing.

The pinion shaft has a maximum diameter of 4¾ inches and is supported on two roller bearings mounted in independent housings that are bolted to the under side of the base. The bearing nearest the pinion is of the straight roller type and the sprocket end bearing is of the spherical roller type. A convenient lock pawl is located on each side of the shaft for engaging the pinion shaft lock ring which is fully protected in the base.

A special labyrinth between the base and the table prevents the entrance of mud into the oil reservoir. A cast steel table guard is available for this rotary machine. It has a non-skid top and is provided with openings around the edge which permit flushing off any mud that might collect on the side of the base.

Casing Head

OIL CENTER TOOL COMPANY

Oil Center Tool Company, Houston, Texas, has developed and proven a Slip-Type Casing Head for use with over-size flanged blowout preventer equipment. It has been designated as Type "C-7X."

The 3-segment slips are enclosed by the hanger, each segment being held in position by an eye-bolt which extends up through the top of the hanger. The entire slip bowl assembly is lowered through the oversize blowout preventer equipment to its seat in the casing head body in one operation.

Figure 1 is a cross-section view of the casing head, showing the hanger seated in the bowl of the head and illustrating the method of attaching the slips to the slip bowl by means of eye-bolts. A wire, or soft line, attached to each of the three eye-bolts, facilitates lowering

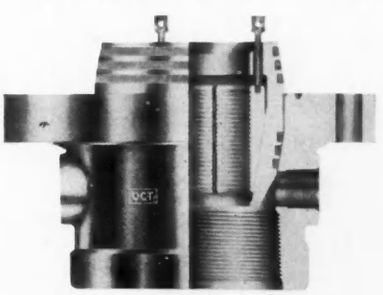
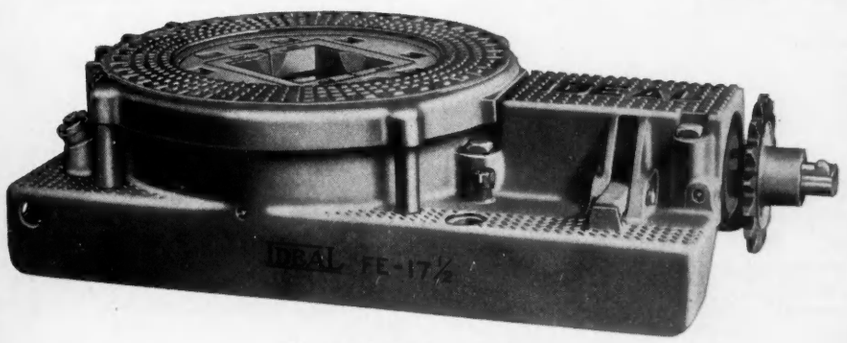


FIGURE 1
O-C-T Type "C-7X" Casing Head

the assembly to its seat. After suspending the casing and cement has set, the blowout preventer hook-up is removed and the eye-bolts are cut off flush with the top of the slip bowl and the holes are welded up. In the same operation, the casing is cut off just above the slip bowl and welded thereto.

Figure 2 illustrates the recommended method of running and landing casing, using the O-C-T Type "C-7X" casing head, a conventional master gate, ram type blowout preventer, and an O-C-T blowout preventer.

After the casing is suspended and the welding operations are completed, an O-C-T Type "T-16" tubing head replaces the blowout preventer hook-up,



National Rotary Machine

REED'S 'B-R' DRILLING BIT WITH WIRE LINE RETRACTABLE CORE BARREL

HARD FORMATION HEAD (Interchangeable with Soft Formation Head)

REED 'B-R' Drill Collar and 3-Blade Drilling Bit with Core Barrel in position

REED ROLLER BIT CO.

Flash!

Have you seen the NEW O'Bannon Tubing Tong? You should, because it's the

Strongest in grip!
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Easiest to handle!

Ask your O'Bannon representative for a demonstration on your next tubing job.

Manufactured by
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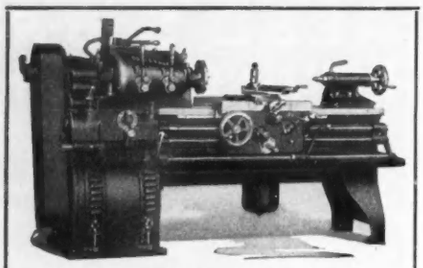
Tulsa Fort Worth

O'BANNON TUBING TONG



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37% Easier Lifting.
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Greater Rack Bar Gib Slide Bearing.
Triple-Toothed Lifting and Retaining Pawls.
Greater Overload Capacity.
More Convenient Carrying Handles.
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SIMPLEX
GOLD MEDAL AWARD SAFETY JACKS

NOTES FOR THE Equipment Buyer and User

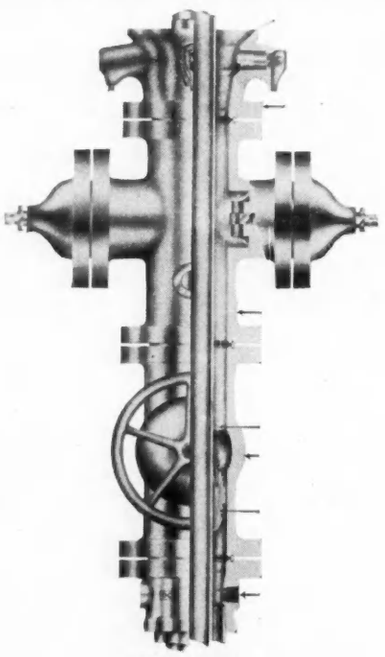


FIGURE 2
O-C-T Blowout Preventer

bolting down on top of the casing head. Three rings of hydraulic packing on top of the Type "C-7X" hanger effect an auxiliary seal between the hanger and the tubing head. Thus, with casing set and cemented and the tubing head bolted down, the annular space is sealed by hydraulic packing on the bottom of the hanger, by hydraulic packing on top of the hanger, by a pressure-tight weld between the casing and the hanger, and by an API ring gasket between flanges of the two heads.

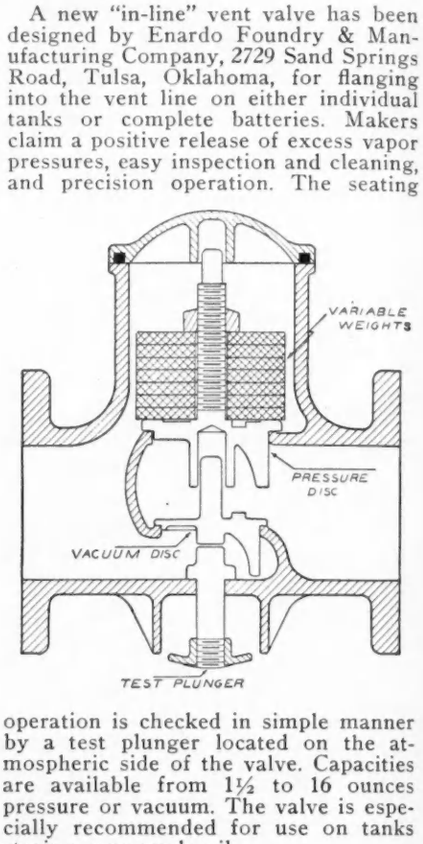
Oil Well Supply Literature

Oil Well Supply Company has released Bulletin No. 118-A on two light and medium duty pumping jacks (Nos. 12 and 16). Top, end, and side elevation drawings, specifications, and foundation plans are included. Bulletin No. 179 covers a five-sheave, fifteen-inch centerpin crown block for moderate depth duty.

Tank Vent-Valves

ENARDO FOUNDRY & MANUFACTURING COMPANY

A new "in-line" vent valve has been designed by Enardo Foundry & Manufacturing Company, 2729 Sand Springs Road, Tulsa, Oklahoma, for flanging into the vent line on either individual tanks or complete batteries. Makers claim a positive release of excess vapor pressures, easy inspection and cleaning, and precision operation. The seating



operation is checked in simple manner by a test plunger located on the atmospheric side of the valve. Capacities are available from 1½ to 16 ounces pressure or vacuum. The valve is especially recommended for use on tanks storing sour crude oil.

Eye Protection

An interestingly-designed, completely illustrated 8-page bulletin on eye protection for every job in industry has just been published by Mine Safety Appliance Company, Braddock, Thomas and Meade Streets, Pittsburgh, Pennsylvania.

A front cover in newspaper form presents impressive statistics of the cost of eye injuries to industry, and features the qualities of the various types of M.S.A. protective lenses. In succeeding pages are described a complete line of goggles and spectacles, welding helmets and shields, combination protective hats with welding shields or goggles and several additional new items.

Die Heads

Landis Machine Company, Waynesboro, Pennsylvania, has issued Bulletin No. F-90 on heat treated die heads for attachment to practically every type of thread cutting machine in service. Features of the heads, which are of highly refined design and adaptable to all cutting operations on ⅜ to 6-inch stock, are explained, and their attachment to turret lathes, bolt threading machines, and automatic screw machines is illustrated.

NOTES FOR THE Equipment Buyer and User

Walter O'Bannon Represents Kibele in Illinois Area

Kibele Manufacturing Company of Dallas, Texas, announces the appointment of the Walter O'Bannon Company of Tulsa as its sales agent for Illinois oil fields and adjacent districts. J. E. Ragan, field representative for the O'Bannon organization in that area, will offer the complete Kibele lines with emphasis on tubing and casing swabs. Sales to the trade will be made only through authorized jobbers.

Landis Machine Company Promotes G. M. Stickell

G. M. Stickell has recently been advanced from assistant sales manager to sales manager of the Landis Machine Company, Waynesboro, Pennsylvania, manufacturers of thread cutting equipment.

Stover Made Secretary-Treasurer of Gaso

Howard F. Stover, purchasing agent and assistant secretary-treasurer for the past 19 years, has been appointed secretary-treasurer and manager of Gaso Pump & Burner Manufacturing Company, succeeding L. D. Armstrong, deceased. Tom H. Flanagan, son of T. J. Flanagan, president of the company, and a member of the organization for the past 5 years, assumes Stover's former duties.

Stover is a native of West Virginia, but his family moved to Tulsa in 1908, when he was seven years old, and he received most of his education in Tulsa schools. His first job was with Gulf Oil Corporation, in its warehouse department, and was followed by service in the World War. After the war he became associated with the Sinclair Pipe Line Company in its materials department, leaving that company in 1920, to join Gaso Pump & Burner Manufacturing Company. He has served as president of the Tulsa Association of Purchasing Agents, and on the board of directors of the National Association of Purchasing Agents.

Tom H. Flanagan received his education at Kemper Military Academy and Tulsa University, and started with the company in 1934, spending more than a year as a mechanic in the company's shops.

Oil Country Specialties Company Establishes Export Department

W. P. "Bill" Turner, president of Oil Country Specialties Manufacturing Company, has announced the establishment of an export sales department at the Pacific Coast plant, 2340 Artesia Street, Long Beach, California. The new department will be equipped to serve all export fields, with special fa-

TOM H. FLANAGAN

HOWARD F. STOVER

REGISTERED PROFESSIONAL ENGINEERS
GAS AIR WATER
REPRESSURING
INSTALLATION OPERATION
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JO H CABLE
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GAS MEASUREMENT PERMEABILITY
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NATURALS for the Field Operator

Light and Power where you want it when you want it . . . that's what you need at the rig and that's exactly what this light, compact, sturdy Witte Dieselectric Plant is designed to give. Non-explosive fuel cuts fire hazard. Produces electricity at less than 1c a k.w.h. Operated by almost anyone without constant care or supervision. For literature and full details of vertical and horizontal plants, write or see your supply dealer.

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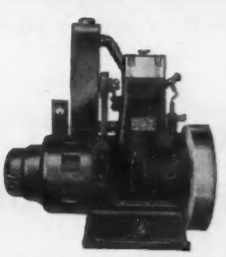
WITTE DIESELECTRIC PLANTS



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1500-2500 6000 watts
Manual Starting
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cilities for marketing in South American countries.

The new department will be headed by W. A. Loomis, a member of the organization for the past nine years.

Lew Cline, former representative for the Titusville Iron Works, and now with O. C. S., recently left New York on a two months' trip to South America for the company. He will visit Venezuela, Colombia and Trinidad, making an extensive study of the equipment market in the interest of the new export sales department. Prior to his affiliation with Titusville Iron Works, Cline was district manager in Wyoming for The Continental Supply Company, and was also representative for that company in the export division.

Petroleum Rectifying President On Extended Trip East

T. N. St. Hill, president of Petroleum Rectifying Company of California, left Los Angeles recently for an extended visit to Chicago, New York and other eastern cities on company business. Returning by the southern route, he is scheduled to spend some time at the company's Gulf Coast headquarters in Houston before returning to his office.

Gene McIntyre Adds Lines to His Sales Agency in Los Angeles

Gene McIntyre, 727 West Seventh Street, Los Angeles, who has been exclusively handling Victaulic couplings, announces that he has increased his representation of oil field equipment manufacturers to include lines of Rector Well Equipment Company, Fort Forth, Texas; W-K-M Company, Houston; Crutcher-Rolfs-Cummings, Houston; Naylor Pipe Company, Chicago, and The Inferno Company, Shreveport, Louisiana. He will continue to represent Victaulic Company of America, New York.

Clark Bros. Executives on Tour of Southwest

Paul Clark, president of Clark Bros. Company and vice president of Dresser Manufacturing Company, was a visitor at the convention of the Natural Gas Section of the American Gas Association, in Tulsa, May 8 to 11, and also attended the American Petroleum Institute meeting in New Orleans. Clark was accompanied by J. B. O'Connor, vice president and sales director of Clark Bros. Company and a director of Dresser Manufacturing Company. They will make a general tour of the Mid-Continent oil fields before returning east.

The Upson-Walton Company Opens Fort Worth Warehouse

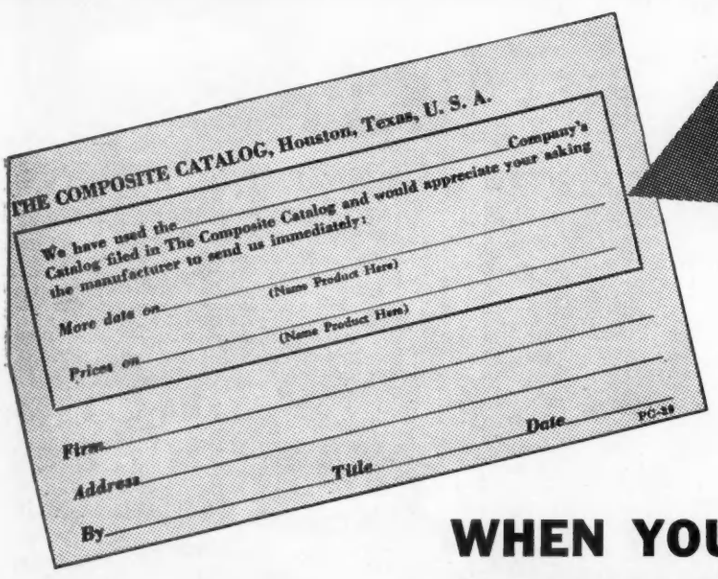
The Upson-Walton Company, Cleveland, Ohio, has purchased a warehouse at 720 West Vickery, Fort Worth, Texas, to stock a complete line of wire rope, cordage, tackle blocks, clips and general wire-line fittings. Business is transacted exclusively through jobbers, and 24-hour service is maintained. D. W. Polkinghorn is Southwestern manager, E. E. Brown, field salesman, and C. T. Daniels in charge of the warehouse and local sales.

Freeman Assigned Area by Texas Creosoting Company

Texas Creosoting Company, Orange, Texas, recently announced that sales territory of George J. Freeman has been expanded to include all of Texas, Louisiana, New Mexico and Arizona. Freeman, who has been associated with the company in the pole sales department for the past 12 years, will continue to make his headquarters at Houston.

George Hamm has seen many advances in the mechanical rubber goods industry since he joined The B. F. Goodrich Company back in 1909. Hamm has devoted the greater portion of this 30-year period to field sales work and is today manager of Goodrich mechanical goods sales for the Kansas City territory. Photograph shows J. H. Conners, vice president and general manager of the Goodrich Mechanical Division, presenting Hamm with a special employee's service pin.

. . . use these Convenient Cards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THE COMPOSITE CATALOG
OF OIL FIELD AND PIPE LINE EQUIPMENT

Squeaks from the Bull Wheel

Polite Retort

Midshipman Gish, you are sentenced to 45 days in the brig on bread and water. How do you like it, sir?

Toasted, sir.

So It Will

Said the toe to the sock:
"Let me through; let me through."
Said the sock to the toe:
"I'll be darned if I do."

One Remedy

Don't you think this room is a bit small?

That is true, but we could put on thinner wallpaper.

Sunday School Skeptic

Do you believe what the teacher said about Adam and Eve walking around the garden without a stitch of clothes on?

Oh, I think that's just some more gossip.

Foul Weather Ahead

I want to do some shopping today, George, if the weather is favorable. What does the paper forecast say?

Rain, hail, sleet, thunder, lightning, snow, and fierce winds.

Insurance Lingo

"What is alimony, Mother?"

"Alimony is a man's cash surrender value, dear."

Observant Tommy

"Tommy, do you know who said 'Whither thou goest I will go'?"

"I guess it musta been a installment collector."

Misunderstood

Freshman—I'm a little stiff from bowling.

Track Coach—I don't care where you're from. Get out and see how fast you can run.

Optimist

What's wrong with that fellow? He's been coming in here every day for a month to stare at those cloverleaf rolls I bake.

Oh, he's just hoping some day to find a four-leaf one.

Sure Fire

Young Millionaire (in night club)—I'm having a triple Scotch and soda. What will you have, Blondie?

Blondie—A husband, if it affects you the way I think it will.

Proof

"What testimony have you as to mathematical ability?"

"I have here my son's homework for last term, sir, in which you will see that 75% of my sums were correct."

Helpful Secretary

"Your little girl wants to kiss you over the phone."

"Take the message. I'll get it from you later."

Heavy Loss

"I lost a fortune."

"How?"

"Well, last night I felt like a million and now I feel like two cents."

Grandmothers Used Up

"There's an office boy called John Simpson working here. May I see him? I'm his grandfather."

"You've just missed him. He's gone to your funeral."

Luxury

The despondent old gentleman emerged from his club and climbed stiffly into his limousine.

"Where to, sir?"

"Drive off a cliff, James. I'm committing suicide!"

Brunette Speaking

"I prefer the simple things in life."

"Yeah, I notice you always go out with blondes."

Dark Mystery

"What fo' dat doctah comin' outa youah house?"

"Ah dunno, but Ah think Ah's got an inkling."

Metaphors

"She wanted me to 'ave a finger in the pie, but I smelt a rat an' nipped it in the bud."

"Lor', Mrs. 'Arris, 'ow you do mix you semaphores."

Manly Manners!

Dickie's father was shocked to see his son making things uncomfortable for his little playmate.

"Why did you do that to Tommie?"

"I am tired of playing with him. I want him to go home."

"Then why didn't you ask him to go home?"

"That wouldn't be polite."

Unfair to Women?

"No matter what I say," remarked the darling wife, "it never seems to bear any fruit."

"Oh," murmured the precious husband from behind his paper. "Then why not try pruning it?"

Such Ignorance

"And why did yez keep Mickey in after school?"

"I asked him who George Washington was, and he only stood and looked at me."

"It's dumfounded the b'y was at yer ignorance, likely."

Not Me

Mrs.: "That brazen Miss Vamp boasts that she has been kissed by every married man in town except one."

Mr. (absent-mindedly): "I wonder who he can be?"

Not Booked

"Can I get a room for three?"

"Have you a reservation?"

"Do I look like an Indian?"

"Clean Out with a MILLER!"

That's the advice of the man who has used the MILLER Sand Pump—seen its powerful suction action clean-out in half the time ..*increase production.*

The MILLER is made in diameters of 2½, 3, 3½, 4, 4¼, 5, 5½, 7 and 9 inches and lengths of 20, 25 and 30 feet. 5/32-inch wall thickness in REGULAR Type, ¼-inch wall tubes HEAVY Type Sand Pumps.

INTERCHANGEABLE BOTTOMS
To Meet Every Condition

● BAILER BOTTOM
With the Bailer Bottom installed the MILLER is quickly changed to a Bailer giving you a combination of either Bailer or a Sand Pump in one tool.

● SAND BOTTOM
Used when tools are run and when well is shot to quickly remove loose material.

● STAR BOTTOM
Used for cutting the sand loose.

● CHISEL BOTTOM
(In Pump)
With this bottom tightly packed sand can be easily broken in small pieces so it can be picked up in the pump.

Write for Descriptive Folder and Price List

See Pages 1564-65 COMPOSITE CATALOG

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